

ANALYTICAL SUMMARY REPORT

Optimizing Fumigant Efficacy While Minimizing Off-target Volatile Emissions

Author
Jane LePage

Research Director
Dr. Vince Hebert

Analytical Laboratory
Washington State University
Food & Environmental Quality Laboratory
2710 University Drive
Richland, WA 99354-1671

Collaboration
Jim Ossman
Western Farm Service
3482 Glade Road
Pasco, WA

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Experimental Start Date: 10/16/2006
Experimental Termination Date: 11/20/2006
Report Date: 3/2007

LOCATION OF RAW DATA

The original raw data, protocol, correspondence logs, and all relevant information for the study titled, "Optimizing Fumigant Efficacy While Minimizing Off-target Volatile Emissions," along with a certified copy of the signed analytical summary report will be maintained in the archives of the testing facility for a period of five years.

Laboratory Site Manager : Dr. Vincent Hebert

Testing Facility: Food and Environmental Quality Laboratory
Washington State University
2710 University Drive
Richland, WA 99354-1671

CERTIFICATION

The undersigned hereby declares that this study was performed according to the procedures described herein, and that this report provides a true and accurate record of the results obtained.

Site Manager: _____ Date: _____
Dr. Vince Hebert, Food and Environmental Quality Laboratory
Washington State University, Tri-City Campus, Richland WA

Field and analytical work performed by:

Dr. Vince Hebert
Jane LePage

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I. Executive Summary

Abstract

The focus of this project was to compare fumigant off-gassing by chemigation and soil-incorporated shank injection with compaction. An air monitoring program was conducted in south Franklin County, WA in the fall of 2006 to examine the comparative degree of off-target fumigant movement using these two application techniques. This study specifically assessed metam sodium's gaseous by-product, methyl isothiocyanate (MITC).

A low pressure center pivot system was used to apply Sectagon 42[®] (42% metam sodium) to a 33 acre circle in October 2006. An adjacent 119 acre crop circle with near-identical soil characteristics was treated with similar application rates of Sectagon 42[®] by shank injection/soil compaction ca. 3 weeks later in early November. Both circles were rotating from corn silage to potato. Near-field MITC emissions were monitored at air sampling stations located around the periphery of each field before, during, and up to 4 days after fumigation. This side-by-side demonstration was developed to aid growers in evaluating chemigation verses soil incorporated shank injection for retaining the fumigant while minimizing off-target MITC emissions, particularly when deciding on application practices near residential communities.

Background

Large production Pacific Northwest (PNW) potato, mint, onion and tree fruit acreages rely on pre-plant soil fumigation to manage soil-borne nematodes and diseases (PMSP 2002). In Washington State, over 10 million pounds of metam-sodium (metam; sodium methyl-dithiocarbamate), are applied to potato fields (NASS 2006). Metam rapidly converts to gaseous MITC on contact with moist soil (Leistra et al., 1974). MITC is the biologically active agent responsible for controlling soil borne nematodes and diseases. Since the reported MITC vapor pressure is exceedingly high (2.5-2.8 kPa @ 20°C), a substantial fraction can escape into the atmosphere unless proper mitigation measures are employed to control surface emissions during and post application (Sullivan et al., 2004).

Center-pivot chemigation has been the principle means of metam application in the PNW. Current metam labels allow application by spray/incorporation, shank injection, drip, sprinkler, and flood irrigation at rates up to 75 gal/acre. Typically, 40 gal/acre metam is applied when using center pivot chemigation. The product label requires that the soil be moist (i.e., between 50 to 85 % of field capacity) before chemigation. The product label also states that metam should be applied with 1-acre-inch of water to spatially set the product. For shank injection practices the product label calls for 15 to 75 gal/acre injected into well prepared soil with shanks, blades, fertilizer wheels or plows, etc., followed by compaction to seal fumigant into the soil. For this comparative study, both the chemigation and the shank injection test sites were treated with Sectagon 42[®] at a rate of 40 gal/acre.

Field Study

This study was developed to evaluate MITC fumigant emissions at both chemigation and shank injection application areas and to examine if these different application practices can aid in better controlling emissions during field fumigation. MITC was monitored in ambient air at eight locations around the edge of each field (Figures 1 and 3). A sampling mast was constructed for each location. The mast consisted of an SKC HiLite air sampling unit placed at the base of a ring-stand with a vertical 1/2-meter height crossbar. Tubing was used to split the flow to collocated 1 or 2 g charcoal-filled cartridges (SKC West) located at each end of the crossbar (Figure 2). The air sampling pumps were operated at four to eight hour intervals before, during and after the fumigation period. At the start and end of collections, flow measurements were recorded. The collected charcoal cartridges were immediately taken to the WSU-Food and Environmental Quality Laboratory (FEQL) where they were stored at -80°C until analysis.

In 2005, FEQL validated a method for determining methyl isothiocyanate (MITC) from charcoal sampling tubes (Hebert, 2006). This method was adapted from California Department of Pesticide Regulation “*Air Monitoring for Methylisothiocyanate During a Sprinkler Application of Metam-Sodium*” Report EH 94-02, 1994. The procedure involved extraction of the charcoal media using a 1:4 mixture of carbon disulfide: ethyl acetate (i.e., 20% carbon disulfide in ethyl acetate) followed by sonication, and filtration through a 0.45 µm Teflon membrane. The sample extract was then analyzed by gas chromatography using nitrogen-phosphorus specific detection (NPD). Additionally, each analytical set was run with concurrent quality control blank and fortified charcoal matrix samples.

Results Summary

For this 2006 study, the analytical method for the measurement of MITC was found to be rugged and was validated in triplicate at 2.5 µg, 25 µg, and 250 µg total MITC. The average MITC recovery from laboratory fortifications performed with each analytical sample set was $106 \pm 13\%$ ($n=34$). Field fortification recoveries were $106 \pm 5\%$ ($n=4$). The method limit of detection (LOD) was estimated to be $0.05 \mu\text{g}/\text{m}^3$ based on 4 L/min air flow for 8 hr sampling interval ($\sim 2 \text{ m}^3$ air sampled). No samples were stored at -80°C for longer than 22 days prior to analysis.

Table 1 summarizes averaged MITC residues from the eight field samplers for each field during the sampling intervals in October and November 2006. A maximum field averaged concentration of $224 \mu\text{g}/\text{m}^3$ was observed during chemigation Whereas, a 10 fold reduction of $22.5 \mu\text{g}/\text{m}^3$ was observed for shank injection during the field fumigation period. Table 2 lists the maximum air concentrations detected during the course of the chemigation and shank injection fumigation events. For the center pivot application, the maximum MITC concentration of $987 \mu\text{g}/\text{m}^3$ was observed during field chemigation. The maximum concentration detected for the shank injection ($141 \mu\text{g}/\text{m}^3$) was observed immediately after completion of the fumigant application.

It is important to note that chemigation and shank injection treatments could not be performed concurrently. Although weather conditions were near ideal for both chemigation and shank treatment events, cooler temperatures were evident during the shank injection treatment (see Appendix B).

Table 1
Field averaged MITC emission from 8 air samplers

Hours post fumigation	Chemigation average MITC air concentration ($\mu\text{g}/\text{m}^3$)	Shank Injection average MITC air concentration ($\mu\text{g}/\text{m}^3$)
Pre application	1.09	0.05
Mid-application	224	22.5
0	59.2	55.7
4	64.6	
12	50.2	22.8
22		15.9
24	18.6	18.6
48	23.0	16.9
96	6.73	22.0

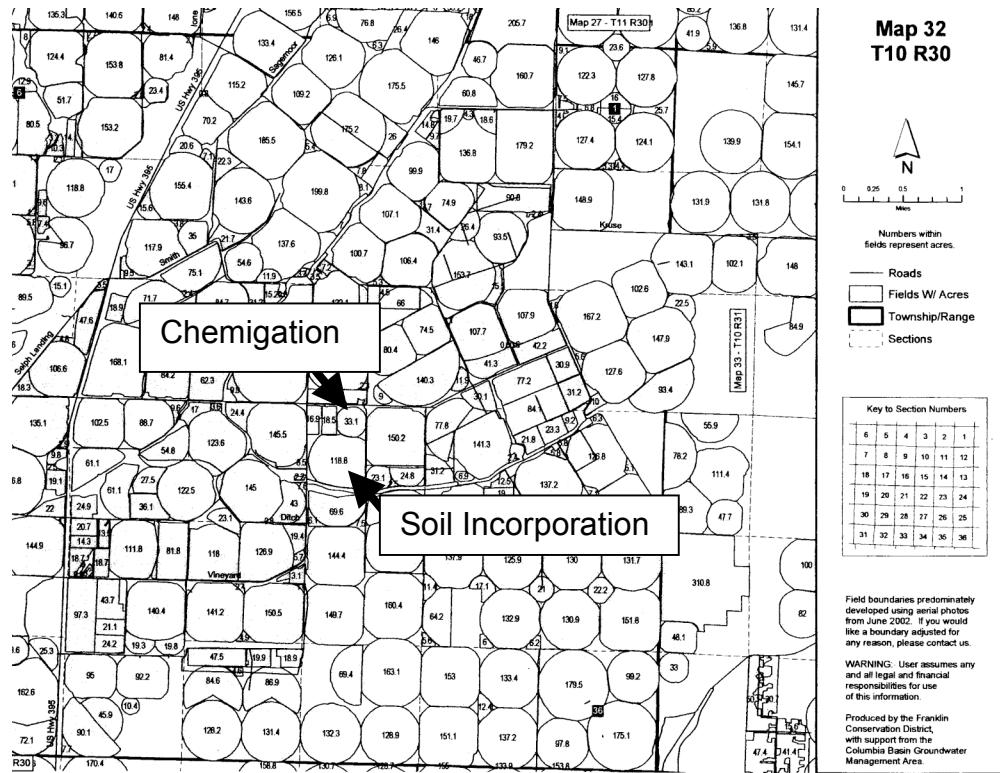
Table 2
Maximum MITC air concentrations

	Maximum air concentration detected ($\mu\text{g}/\text{m}^3$)
Field 1 Chemigation air sample F1-B-4L	987
Field 2 Shank Injection air sample F1-B-10L	141

References

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- Sullivan DA, Holdsworth MT, Hlinka, DJ. Control of off-gassing rates of methyl isothiocyanate from the application of metam-sodium by chemigation and shank injection. *Atmos. Environ.* 38 2457–2470, (2004).

Figure 1
South Franklin County, Washington State *



*From: Franklin County Atlas. Franklin Conservation District (2002)

Figure 2
Schematic of sampling mast

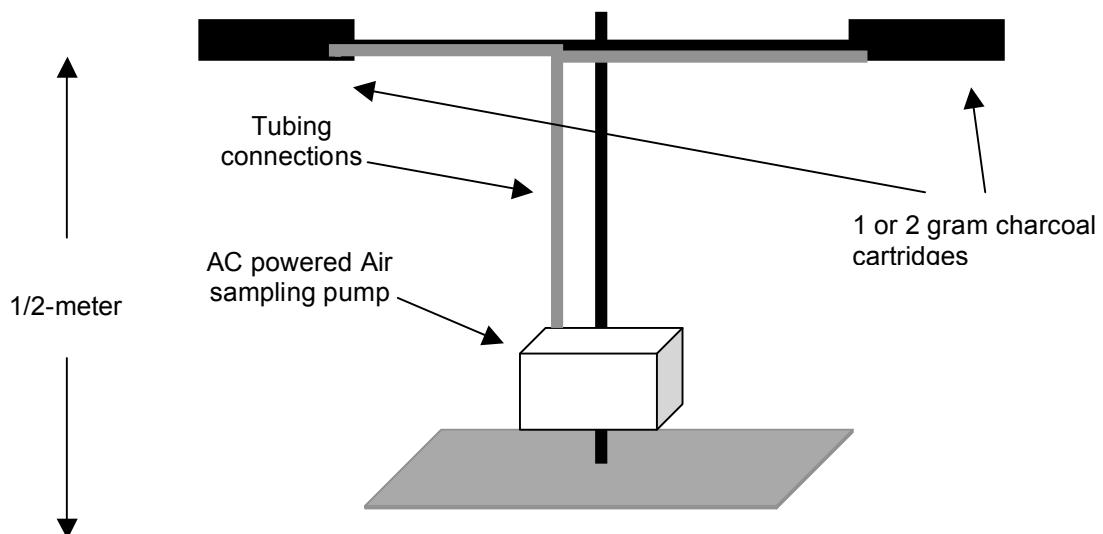
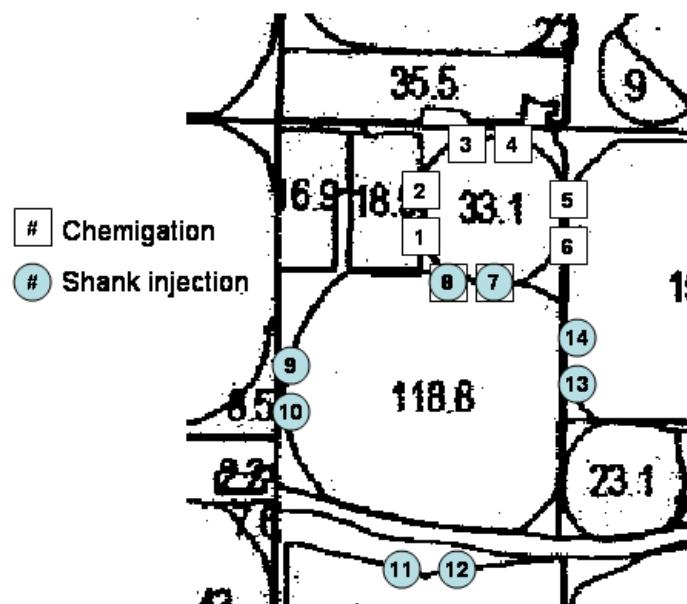


Figure 3
Air sampler locations



II. Field Summary

Off target movement during and post metam fumigation may represent significant loss of the active compound, methyl isothiocyanate (MITC). This air monitoring study was initiated in October 2006 to determine the relative degree of MITC off target movement from two different fumigation practices, center pivot chemigation and soil shank injection.

A. Trial Locations

This field study was conducted on neighboring crop circles in south Franklin County (Figure 1). Both circles will be rotating from corn silage into potato production in 2007.

Chemigation: Western Farm Service applied Sectagon 42 by chemigation according to label requirements to a 33.1 acre circle. Chemigation was incorporated with ca. 1 inch of water to set the product at a desired soil depth. The application time over the 33.1 acre circle was approximately 48 hours.

Soil-incorporated shank injection: Western Farm Service fumigated a 118.8 acre field by shank injection with soil compaction according to label requirements. The application took place during two 8-12 hour shifts over a 48-hour time frame.

Air monitoring sites: Air samplers at the two field plots were positioned on the periphery of each field at approximately the north, south, east and west sides. Air was monitored pre-application, during fumigation and at discrete intervals up to 4 days post-application. Figure 3 roughly illustrates the locations of the air samplers at each field.

B. Sample Inventory/History

Air monitoring was conducted in October and November 2006 to respectively correspond with chemigation and shank fumigations. After each 2-8 hour interval of air sampling the charcoal air sampling tubes were removed and transferred to the Food & Environmental Quality Laboratory (FEQL), Washington State University, 2710 University Drive, Richland, WA where they were logged and placed in frozen storage (-80°C) until analysis. Tables 3 and 4 list the sample inventory and history for the chemigation and shank injection test sites, respectively.

Sample Coding: The samples acquired from the field were given a unique sample code. This code was constructed so that each individual sample at each site location had unique alphanumeric values that were traceable. The coding designations were as follows:

Field	Time Interval	Air sampler designation	Collocation (Right/Left)
F1 (chemigation)	A-H	1-8	R/L
F2 (shank injection)	A-H	7-14	R/L

Table 3
Field 1 Chemigation Air Sample Inventory & History

Date sampled	Time interval	Sample ID	Start time	End time	Total air sampled (m ³)	Date analyzed
10/16/2006	A ~ 12 hr pre-application 1 g cartridge, ~4 hr air sample	F1-A-1R	6:05 PM	10:00 PM	1.06	11/8/2006
		F1-A-1L	6:05 PM	10:00 PM	0.76	
		F1-A-2R	6:07 PM	10:00 PM	1.05	
		F1-A-2L	6:07 PM	10:00 PM	1.02	
		F1-A-3R	6:14 PM	10:11 PM	1.07	
		F1-A-3L	6:14 PM	10:11 PM	0.98	
		F1-A-4R	6:16 PM	10:11 PM	0.94	
		F1-A-4L	6:16 PM	10:11 PM	1.06	
		F1-A-5R	NS	NS	NS	
		F1-A-5L	NS	NS	NS	
		F1-A-6R	NS	NS	NS	
		F1-A-6L	NS	NS	NS	
		F1-A-7R	6:37 PM	10:22 PM	0.90	
		F1-A-7L	6:37 PM	10:22 PM	0.90	
		F1-A-8R	6:35 PM	10:22 PM	0.94	
		F1-A-8L	6:35 PM	10:22 PM	0.91	

NS=No sample due to failure of air sample pump.

Date sampled	Time interval	Sample ID	Start time	End time	Total air sampled (m ³)	Date analyzed
10/18/2006	B – During chemigation 1 g cartridge, ~2 hr air sample	F1-B-1R	7:48 AM	9:48 AM	0.48	11/6/2006
		F1-B-1L	7:48 AM	9:48 AM	0.48	
		F1-B-2R	7:48 AM	9:48 AM	0.50	
		F1-B-2L	7:48 AM	9:48 AM	0.54	
		F1-B-3R	7:37 AM	9:37 AM	0.51	
		F1-B-3L	7:37 AM	9:37 AM	0.51	
		F1-B-4R	7:37 AM	9:37 AM	0.54	
		F1-B-4L	7:37 AM	9:37 AM	0.51	
		F1-B-5R	7:26 AM	9:25 AM	0.49	
		F1-B-5L	7:26 AM	9:25 AM	0.51	
		F1-B-6R	7:26 AM	9:25 AM	0.51	
		F1-B-6L	7:26 AM	9:25 AM	0.46	
		F1-B-7R	7:53 AM	9:53 AM	0.48	
		F1-B-7L	7:53 AM	9:53 AM	0.48	
		F1-B-8R	7:58 AM	9:58 AM	0.48	
		F1-B-8L	7:58 AM	9:58 AM	0.51	

Date sampled	Time interval	Sample ID	Start time	End time	Total air sampled (m ³)	Date analyzed
10/19/2006	C ~ 0 hr, post-chemigation 1 g cartridge, ~4 hr air sample	F1-C-1R	8:24 AM	12:24 PM	0.93	11/2/2006
		F1-C-1L	8:24 AM	12:24 PM	0.93	
		F1-C-2R	8:25 AM	12:26 PM	0.93	
		F1-C-2L	8:25 AM	12:26 PM	1.05	
		F1-C-3R	8:30 AM	12:32 PM	0.97	
		F1-C-3L	8:30 AM	12:32 PM	1.06	
		F1-C-4R	8:30 AM	12:36 PM	1.08	
		F1-C-4L	8:30 AM	12:36 PM	1.08	
		F1-C-5R	8:36 AM	12:41 PM	0.92	
		F1-C-5L	8:36 AM	12:41 PM	0.98	
		F1-C-6R	8:37 AM	12:45 PM	0.90	
		F1-C-6L	8:37 AM	12:45 PM	0.99	
		F1-C-7R	8:18 AM	12:18 PM	0.96	
		F1-C-7L	8:18 AM	12:18 PM	0.96	
		F1-C-8R	8:19 AM	12:19 PM	0.90	
		F1-C-8L	8:19 AM	12:19 PM	0.90	

Date sampled	Time interval	Sample ID	Start time	End time	Total air sampled (m ³)	Date analyzed
10/19/2006	D ~ 4 hr, post-chemigation 1 g cartridge, ~4 hr air sample	F1-D-1R	12:24 PM	4:24 PM	0.81	11/2/2006
		F1-D-1L	12:24 PM	4:24 PM	0.93	
		F1-D-2R	12:28 PM	4:28 PM	0.87	
		F1-D-2L	12:28 PM	4:28 PM	0.93	
		F1-D-3R	12:34 PM	4:34 PM	0.87	
		F1-D-3L	12:34 PM	4:34 PM	0.96	
		F1-D-4R	12:37 PM	4:37 PM	1.02	
		F1-D-4L	12:37 PM	4:37 PM	1.05	
		F1-D-5R	12:44 PM	4:44 PM	0.90	
		F1-D-5L	12:44 PM	4:44 PM	0.90	
		F1-D-6R	12:46 PM	4:46 PM	0.81	
		F1-D-6L	12:46 PM	4:46 PM	0.78	
		F1-D-7R	12:18 PM	4:18 PM	0.93	
		F1-D-7L	12:18 PM	4:18 PM	0.96	
		F1-D-8R	12:20 PM	4:20 PM	0.87	
		F1-D-8L	12:20 PM	4:20 PM	0.90	

Date sampled	Time interval	Sample ID	Start time	End time	Total air sampled (m ³)	Date analyzed
10/19/2006	E ~ 12 hr, post-chemigation 1 g cartridge, ~4 hr air sample	F1-E-1R	8:45 PM	1:15 AM	1.15	11/1/2006
		F1-E-1L	8:45 PM	1:15 AM	1.15	
		F1-E-2R	8:45 PM	1:15 AM	1.18	
		F1-E-2L	8:45 PM	1:15 AM	1.15	
		F1-E-3R	8:35 PM	1:28 AM	1.17	
		F1-E-3L	8:35 PM	1:28 AM	1.25	
		F1-E-4R	8:35 PM	1:28 AM	1.39	
		F1-E-4L	8:35 PM	1:28 AM	1.32	
		F1-E-5R	8:25 PM	1:35 AM	1.55	
		F1-E-5L	8:25 PM	1:35 AM	1.24	
		F1-E-6R	8:25 PM	1:35 AM	1.32	
		F1-E-6L	8:25 PM	1:35 AM	1.24	
		F1-E-7R	8:55 PM	1:10 AM	1.15	
		F1-E-7L	8:55 PM	1:10 AM	1.15	
		F1-E-8R	8:55 PM	1:10 AM	1.15	
		F1-E-8L	8:55 PM	1:10 AM	1.15	

Date sampled	Time interval	Sample ID	Start time	End time	Total air sampled (m ³)	Date analyzed
10/20/2006	F ~ 24 hr, post-chemigation 2 g cartridge, ~8 hr air sample	F1-F-1R	8:29 AM	4:30 PM	1.86	10/31/2006
		F1-F-1L	8:29 AM	4:30 PM	2.04	
		F1-F-2R	8:31 AM	4:30 PM	2.04	
		F1-F-2L	8:31 AM	4:30 PM	2.04	
		F1-F-3R	8:39 AM	4:38 PM	2.04	
		F1-F-3L	8:39 AM	4:38 PM	2.04	
		F1-F-4R	8:41 AM	4:38 PM	2.15	
		F1-F-4L	8:41 AM	4:38 PM	2.15	
		F1-F-5R	8:50 AM	4:48 PM	2.03	
		F1-F-5L	8:50 AM	4:48 PM	1.91	
		F1-F-6R	8:52 AM	4:48 PM	1.90	
		F1-F-6L	8:52 AM	4:48 PM	1.90	
		F1-F-7R	8:17 AM	4:21 PM	1.75	
		F1-F-7L	8:17 AM	4:21 PM	1.94	
		F1-F-8R	8:20 AM	4:23 PM	1.93	
		F1-F-8L	8:20 AM	4:23 PM	2.17	

Date sampled	Time interval	Sample ID	Start time	End time	Total air sampled (m ³)	Date analyzed
10/21/2006	G ~ 48 hr, post-chemigation 2 g cartridge, ~8 hr air sample	F1-G-1R	8:23 AM	4:23 PM	2.04	10/30/2006
		F1-G-1L	8:23 AM	4:23 PM	2.04	
		F1-G-2R	8:25 AM	4:23 PM	2.03	
		F1-G-2L	8:25 AM	4:23 PM	2.09	
		F1-G-3R	8:35 AM	4:40 PM	2.18	
		F1-G-3L	8:35 AM	4:40 PM	2.00	
		F1-G-4R	8:38 AM	4:40 PM	2.17	
		F1-G-4L	8:38 AM	4:40 PM	2.23	
		F1-G-5R	8:48 AM	4:51 PM	1.99	
		F1-G-5L	8:48 AM	4:51 PM	2.11	
		F1-G-6R	8:51 AM	4:51 PM	1.92	
		F1-G-6L	8:51 AM	4:51 PM	1.92	
		F1-G-7R	8:11 AM	4:15 PM	1.88	
		F1-G-7L	8:11 AM	4:15 PM	1.94	
		F1-G-8R	8:13 AM	4:15 PM	2.11	
		F1-G-8L	8:13 AM	4:15 PM	2.11	

Date sampled	Time interval	Sample ID	Start time	End time	Total air sampled (m ³)	Date analyzed
10/23/2006	H ~ 96 hr, post-chemigation 2 g cartridge, ~8 hr air sample	F1-H-1L	8:50 AM	4:52 PM	1.99	10/24/2006
		F1-H-1R	8:50 AM	4:52 PM	1.81	
		F1-H-2L	8:50 AM	4:52 PM	2.05	
		F1-H-2R	8:50 AM	4:52 PM	2.05	
		F1-H-3L	9:02 AM	5:12 PM	2.02	
		F1-H-3R	9:02 AM	5:12 PM	2.02	
		F1-H-4R	NS	NS	NS	
		F1-H-4L	NS	NS	NS	
		F1-H-5L	9:10 AM	5:25 PM	1.98	
		F1-H-5R	9:10 AM	5:25 PM	2.10	
		F1-H-6L	9:10 AM	5:25 PM	2.04	
		F1-H-6R	9:10 AM	5:25 PM	2.04	
		F1-H-7L	8:40 AM	4:40 PM	1.80	
		F1-H-7R	8:40 AM	4:40 PM	1.80	
		F1-H-8L	8:40 AM	4:40 PM	1.86	
		F1-H-8R	8:40 AM	4:40 PM	1.80	

NS=No sample due to failure of air sample pump.

Table 4
Field 2 Shank Injection Air Sample Inventory & History

Date sampled	Time interval	Sample ID	Start time	End time	Total air sampled (m ³)	Date analyzed
11/13/2006	A ~ 18 hr, pre-shank injection commencement 1 g cartridge, ~4 hr air sample	F2-A-7R	11:44 AM	3:38 PM	0.94	11/21/2006
		F2-A-7L	11:44 AM	3:38 PM	0.94	
		F2-A-8R	11:44 AM	3:38 PM	0.94	
		F2-A-8L	11:44 AM	3:38 PM	0.94	
		F2-A-9R	11:27 AM	3:24 PM	0.95	
		F2-A-9L	11:27 AM	3:24 PM	0.95	
		F2-A-10R	11:27 AM	3:24 PM	0.83	
		F2-A-10L	11:27 AM	3:24 PM	0.92	
		F2-A-11R	12:29 PM	4:19 PM	0.92	
		F2-A-11L	12:29 PM	4:19 PM	0.95	
		F2-A-12R	12:29 PM	4:19 PM	0.95	
		F2-A-12L	12:29 PM	4:19 PM	0.95	
		F2-A-13R	11:59 AM	3:52 PM	0.99	
		F2-A-13L	11:59 AM	3:52 PM	0.93	
		F2-A-14R	11:59 AM	3:52 PM	0.99	
		F2-A-14L	11:59 AM	3:52 PM	0.93	

Date sampled	Time interval	Sample ID	Start time	End time	Total air sampled (m ³)	Date analyzed
11/15/2006	B – During shank injection 1 g cartridge, ~2 hr air sample	F2-B-7R	7:58 AM	9:58 AM	0.45	12/5/2006
		F2-B-7L	7:58 AM	9:58 AM	0.48	
		F2-B-8R	7:58 AM	9:58 AM	0.42	
		F2-B-8L	7:58 AM	9:58 AM	0.47	
		F2-B-9R	7:48 AM	9:48 AM	0.47	
		F2-B-9L	7:48 AM	9:48 AM	0.48	
		F2-B-10R	7:48 AM	9:48 AM	0.45	
		F2-B-10L	7:48 AM	9:48 AM	0.48	
		F2-B-11R	8:28 AM	10:29 AM	0.48	
		F2-B-11L	8:28 AM	10:29 AM	0.48	
		F2-B-12R	8:28 AM	10:29 AM	0.48	
		F2-B-12L	8:28 AM	10:29 AM	0.48	
		F2-B-13R	8:08 AM	10:14 AM	0.54	
		F2-B-13L	8:08 AM	10:14 AM	0.57	
		F2-B-14R	8:08 AM	10:14 AM	0.57	
		F2-B-14L	8:08 AM	10:14 AM	0.50	

Date	Time interval	Sample	Start time	End time	Total air	Date

sampled		ID			sampled (m³)	analyzed
11/15/2006	C ~ 0 hr, post-shank injection 1 g cartridge, ~4 hr air sample	F2-C-7R	2:25 PM	6:35 PM	1.06	12/5/2006
		F2-C-7L	2:25 PM	6:35 PM	1.00	
		F2-C-8R	2:25 PM	6:35 PM	1.03	
		F2-C-8L	2:25 PM	6:35 PM	1.00	
		F2-C-9R	2:10 PM	6:10 PM	1.08	
		F2-C-9L	2:10 PM	6:10 PM	1.02	
		F2-C-10R	2:10 PM	6:10 PM	1.08	
		F2-C-10L	2:10 PM	6:10 PM	1.08	
		F2-C-11R	2:00 PM	6:00 PM	1.02	
		F2-C-11L	2:00 PM	6:00 PM	1.02	
		F2-C-12R	2:00 PM	6:00 PM	1.02	
		F2-C-12L	2:00 PM	6:00 PM	1.02	
		F2-C-13R	2:16 PM	6:20 PM	1.16	
		F2-C-13L	2:16 PM	6:20 PM	1.16	
		F2-C-14R	2:16 PM	6:20 PM	1.04	
		F2-C-14L	2:16 PM	6:20 PM	1.10	

Date sampled	Time interval	Sample ID	Start time	End time	Total air sampled (m³)	Date analyzed
11/16/2006	D ~ 18 hr, post-shank injection 1 g cartridge, ~4 hr air sample	F2-D-7R	7:08 AM	10:55 AM	0.99	12/4/2006
		F2-D-7L	7:08 AM	10:55 AM	0.96	
		F2-D-8R	7:08 AM	10:55 AM	1.02	
		F2-D-8L	7:08 AM	10:55 AM	0.99	
		F2-D-9R	7:36 AM	11:22 AM	1.02	
		F2-D-9L	7:36 AM	11:22 AM	1.02	
		F2-D-10R	7:36 AM	11:26 AM	1.01	
		F2-D-10L	7:36 AM	11:26 AM	0.95	
		F2-D-11R	7:46 AM	11:35 AM	1.03	
		F2-D-11L	7:46 AM	11:35 AM	1.03	
		F2-D-12R	7:46 AM	11:32 AM	1.07	
		F2-D-12L	7:46 AM	11:32 AM	1.02	
		F2-D-13R	7:23 AM	11:13 AM	1.21	
		F2-D-13L	7:23 AM	11:13 AM	1.09	
		F2-D-14R	7:23 AM	11:08 AM	1.21	
		F2-D-14L	7:23 AM	11:08 AM	1.13	

Date sampled	Time interval	Sample ID	Start time	End time	Total air sampled (m ³)	Date analyzed
11/16/2006	E ~ 22 hr, post-shank injection 1 g cartridge, ~4 hr air sample	F2-E-7R	10:58 AM	3:14 PM	1.06	11/29/2006
		F2-E-7L	10:58 AM	3:14 PM	1.06	
		F2-E-8R	10:55 AM	3:14 PM	1.04	
		F2-E-8L	10:55 AM	3:14 PM	1.04	
		F2-E-9R	11:22 AM	3:54 PM	1.16	
		F2-E-9L	11:22 AM	3:54 PM	1.22	
		F2-E-10R	11:26 AM	3:54 PM	1.14	
		F2-E-10L	11:26 AM	3:54 PM	1.14	
		F2-E-11R	11:37 AM	3:40 PM	1.06	
		F2-E-11L	11:37 AM	3:40 PM	1.09	
		F2-E-12R	11:33 AM	3:40 PM	1.08	
		F2-E-12L	11:33 AM	3:40 PM	1.08	
		F2-E-13R	11:14 AM	3:26 PM	1.23	
		F2-E-13L	11:14 AM	3:26 PM	1.23	
		F2-E-14R	11:08 AM	3:26 PM	1.35	
		F2-E-14L	11:08 AM	3:26 PM	1.39	

Date sampled	Time interval	Sample ID	Start time	End time	Total air sampled (m ³)	Date analyzed
11/17/2006	F ~ 1 day, post-shank injection 2 g cartridge, ~8 hr air sample	F2-F-7R	6:50 AM	3:07 PM	1.99	11/28/2006
		F2-F-7L	6:50 AM	3:07 PM	1.93	
		F2-F-8R	6:50 AM	3:04 PM	2.22	
		F2-F-8L	6:50 AM	3:04 PM	2.22	
		F2-F-9R	7:25 AM	3:32 PM	2.31	
		F2-F-9L	7:25 AM	3:32 PM	2.25	
		F2-F-10R	7:25 AM	3:33 PM	2.32	
		F2-F-10L	7:25 AM	3:33 PM	2.32	
		F2-F-11R	7:16 AM	3:27 PM	2.33	
		F2-F-11L	7:16 AM	3:27 PM	2.33	
		F2-F-12R	7:16 AM	3:27 PM	2.33	
		F2-F-12L	7:16 AM	3:27 PM	2.39	
		F2-F-13R	7:02 AM	3:16 PM	2.53	
		F2-F-13L	7:02 AM	3:16 PM	2.59	
		F2-F-14R	7:02 AM	3:15 PM	2.47	
		F2-F-14L	7:02 AM	3:15 PM	2.71	

Date sampled	Time interval	Sample ID	Start time	End time	Total air sampled (m ³)	Date analyzed
11/18/2006	G ~ 48 hr, post-shank injection 2 g cartridge, ~8 hr air sample	F2-G-7R	7:42 AM	2:30 PM	1.63	11/27/2006
		F2-G-7L	7:42 AM	2:30 PM	1.48	
		F2-G-8R	7:40 AM	2:30 PM	1.79	
		F2-G-8L	7:40 AM	2:30 PM	1.85	
		F2-G-9R	7:26 AM	3:03 PM	2.11	
		F2-G-9L	7:26 AM	3:03 PM	2.00	
		F2-G-10R	7:23 AM	3:03 PM	2.07	
		F2-G-10L	7:23 AM	3:03 PM	2.13	
		F2-G-11R	7:07 AM	2:55 PM	2.28	
		F2-G-11L	7:07 AM	2:55 PM	2.16	
		F2-G-12R	7:05 AM	2:55 PM	2.23	
		F2-G-12L	7:05 AM	2:55 PM	2.23	
		F2-G-13R	7:57 AM	2:42 PM	2.08	
		F2-G-13L	7:57 AM	2:42 PM	2.08	
		F2-G-14R	7:54 AM	2:42 PM	2.09	
		F2-G-14L	7:54 AM	2:42 PM	2.04	

Date sampled	Time interval	Sample ID	Start time	End time	Total air sampled (m ³)	Date analyzed
11/20/2006	H ~ 96 hr, post-shank injection 2 g cartridge, ~8 hr air sample	F2-H-7R	7:03 AM	3:05 PM	1.69	11/27/2006
		F2-H-7L	7:03 AM	3:05 PM	1.69	
		F2-H-8R	7:03 AM	3:05 PM	1.81	
		F2-H-8L	7:03 AM	3:05 PM	1.93	
		F2-H-9R	7:42 AM	2:45 PM	2.01	
		F2-H-9L	7:42 AM	2:45 PM	1.90	
		F2-H-10R	7:42 AM	2:45 PM	1.84	
		F2-H-10L	7:42 AM	2:45 PM	1.96	
		F2-H-11R	7:25 AM	2:25 PM	1.84	
		F2-H-11L	7:25 AM	2:25 PM	1.94	
		F2-H-12R	7:25 AM	NS	NS	
		F2-H-12L	7:25 AM	NS	NS	
		F2-H-13R	7:15 AM	3:28 PM	2.22	
		F2-H-13L	7:15 AM	3:28 PM	2.22	
		F2-H-14R	7:15 AM	NS	NS	
		F2-H-14L	7:15 AM	NS	NS	

NS=No sample due to failure of air sample pump.

C. Field Spikes

During the post-fumigation air monitoring period, air sampling cartridges were fortified with a known amount of MITC at the FEQL facility and attached to an air sample pump at air flow rates typical of what was used for the field samples. These field spike fortifications were performed to verify quantitative retention of the MITC on the charcoal. The 1-gram cartridge fortified field spikes were run for four hours. The 2-gram cartridges were exposed to nine hours of air sampling outside on the WSU Richland campus. The average MITC recovery from field spikes was $106\% \pm 5\%$.

D. Weather Data

Weather data from the Washington State Ag Weather Net at the Columbia Basin College was accessed for a complete profile of regional weather during the fumigation events. The Ag Weather Net weather data for the two sampling intervals is provided in Appendix B.

III. Storage Stability Study

A storage stability evaluation for MITC on charcoal-filled glass cartridges was completed by the FEQL in 2005 (MITC Community Air Assessment. Analytical Summary Report, FEQL-NG-0605). MITC was found to be stable on the cartridges stored at -80°C for a period of 85 days. For this 2006 field fumigation air monitoring project, no air sample cartridges were stored at -80°C for more than 22 days.

IV. Standard Preparation

Standards were prepared to bracket the range of residues expected in the charcoal samples. The following test substances, standards, and standard dilutions were used for this study:

<u>Test substance</u>			
<u>Compound</u>	<u>Substance No.</u>	<u>Purity</u>	<u>Source</u>
Methyl isothiocyanate	131600	99.5%	Chem Service
<u>Stock Solution</u>			
<u>Compound</u>	<u>Substance No.</u>	<u>Conc.</u>	<u>Solvent</u>
Methyl isothiocyanate	13164	10 mg/mL	methanol
<u>Dilution of Stock Solution</u>			
<u>Compound</u>	<u>Substance No.</u>	<u>Conc.</u>	<u>Solvent</u>
Methyl isothiocyanate	131642	20 $\mu\text{g}/\text{mL}$	20% CS ₂ /ethyl acetate
Methyl isothiocyanate	131643	10 $\mu\text{g}/\text{mL}$	20% CS ₂ /ethyl acetate
Methyl isothiocyanate	131644	5.0 $\mu\text{g}/\text{mL}$	20% CS ₂ /ethyl acetate
Methyl isothiocyanate	131645	1.0 $\mu\text{g}/\text{mL}$	20% CS ₂ /ethyl acetate
Methyl isothiocyanate	131646	0.5 $\mu\text{g}/\text{mL}$	20% CS ₂ /ethyl acetate
Methyl isothiocyanate	131649	0.2 $\mu\text{g}/\text{mL}$	20% CS ₂ /ethyl acetate

Methyl isothiocyanate 131647 0.1 µg/mL 20% CS₂/ethyl acetate

Fortification Solutions

Compound	Substance No.	Conc.	Solvent
Methyl isothiocyanate	131641	1 mg/mL	20% CS ₂ /ethyl acetate
Methyl isothiocyanate	13164	10 mg/mL	methanol

All standard solutions were stored in the freezer at approximately – 20 °C (I.D. Prancer). The expiration date for the reference substance is 04/2009. Dilutions are recorded in the FEQL analytical laboratory standards logbook.

V. Analytical Procedure

A. Working Analytical Method

In 2005, FEQL validated a method for determining methyl isothiocyanate (MITC) from charcoal sampling tubes (FEQL-NG-0605). The working method for this study is provided as Attachment B. The one or two grams of charcoal were poured from the glass cartridge into 25 mL Corex® tubes. A volumetric amount of extraction solvent (5 mL of 20% carbon disulfide, 80% ethyl acetate) was added and the samples were sonicated for approximately 2 minutes. Samples were then filtered using Whatman 0.45 µm PTFE syringe filter and placed in auto sampler vials for analysis by gas chromatography with nitrogen phosphorus detection (GC/NPD)

B. Quantification

i. Instrumentation

A Varian Star 3400CX gas chromatograph using nitrogen-phosphorus specific detection (NPD) with 8200CX autosampler was used for residue detection and quantification. Integration of chromatographic data was performed using Varian Star Chromatography Workstation software.

Column: JW Scientific DB-1701, 15m x 0.53mm, 1 µm film thickness

Carrier gas: Ultrapure helium,
column flow rate ca 4.8 mL/min at 55 °C.

Temperatures: Detector: 300 °C

Injector port: 55 °C to 225°C (rate: 225°C/min), hold
5 min.

Oven program: Initial: 55°C, hold for 0.09min.
Ramp 5°C/min to 80°C, hold for 4 min.

MITC Retention time: 2.5 min (+/-0.1 min)

Injection volume: 2 μL

ii Calculations

The quantification of MITC residues in the charcoal air sample cartridges was performed by electronic peak area measurement and comparison to the linear regression from a minimum of four external standards in the concentration range of the matrix-sample residues. To assure high quality during GC operation, all samples were bracketed with external calibration standards during the analytical set. Linearity and calibration standards were then used to construct the calibration curve using a spreadsheet program (Microsoft Excel[®]). The MITC air concentration is calculated according to equations 1 and 2.

Eq 1: Total Residue (μg) = ($x \mu\text{g/mL}$ detected concentration) (Final volume of extract)

For example, sample set F2-B, dated 12/5/2006 included the preparation of air sample F2-B-10R (sample date 11/15/06). The sample was processed for analysis to a final volume of 5 mL. The MITC linear regression line of best fit calculated from calibration standards ($R^2 = 0.998$) of this set was:

$$Y (\text{area counts}) = 22137.7 X (\text{detected concentration in } \mu\text{g/mL}) + 1794.5$$

The MITC-peak area count for this residue sample was 180751. Therefore, the concentration (in $\mu\text{g/mL}$) was:

$$X = \frac{(180751 - 1794.5)}{22137.7} = 8.084 \mu\text{g/mL}$$

The total residue is then calculated according to Eq. 1:

$$8.08 \mu\text{g/mL} \times 5 \text{ mL} = 40.42 \mu\text{g MITC}$$

To determine air concentration, the total MITC residue was divided by the volume of air sampled, Eq. 2. The volume of air was found by multiplying the average flow rate (L/min) by the total minutes of sampling, and converting from liters to m^3 .

Eq.2: MITC air concentration ($\mu\text{g/m}^3$) = $X \mu\text{g MITC residue / total air sampled (m}^3\text{)}$

From the example above, the air sampler operated at an average flow rate of 3.75 L/min from 7:48 am to 9:48 am or 120 minutes.

$$(3.75 \text{ L/min})(120 \text{ min}) = 450 \text{ L}$$

$$(450 \text{ L})(1 \text{ m}^3/1000 \text{ L conversion factor}) = 0.45 \text{ m}^3 \text{ air sampled}$$

Therefore by equation 2, MITC air concentration

$$X (\mu\text{g}/\text{m}^3) = 40.42 \mu\text{g MITC} / 0.45 \text{ m}^3 = 89.82 \mu\text{g}/\text{m}^3 \text{ MITC}$$

To assess overall analysis precision and percent recovery, control cartridges were fortified with a known amount of MITC prior to extraction. For each analytical set, percent recovery for the fortified sample was calculated using peak areas according to equation 3.

$$\text{Eq.3: \% Recovery} = \frac{(\text{Fortified Peak} - \text{Control Peak})}{\text{Calculated Residue}} \times 100 \\ \text{Fortification Amount}$$

For example, a fortified control cartridge included in set F2-B (1106-FS35), was fortified with 150 µg of MITC. The sample extract was prepared to a final volume of 10 mL for residue determination. The MITC peak area count for this fortified sample was 313966. The peak area count for its corresponding control at the same dilution was 0 area counts. The fortified sample concentration calculated from the linear regression for this set is 14.101 µg /mL MITC.

The total residue is then calculated according to Eq. 1:

$$14.101 \mu\text{g} / \text{mL} \times 10 \text{ mL} = 141.01 \mu\text{g MITC}$$

From Eq. 3, the percent recovery for this fortified sample was:

$$\text{Percent Recovery} = \frac{141.01 \mu\text{g}}{150 \mu\text{g}} \times 100 = 94\%$$

C. Method Validation and Analytical Limits

In addition to method validation and fortification recovery work performed in 2005 (FEQL-NG-0605) and prior to 2006 air sample analysis, the working method was validated by fortifying 1 g and 2 g charcoal cartridges at 2.5 µg, 25 µg, and 250 µg MITC. The method was validated in triplicate at each fortification level. The working method was considered validated if recovery of MITC was within the range of 70%-120% with a standard deviation of <20%. Additionally, a control and two fortified matrix samples were extracted concurrently with study samples. Furthermore, when residue values exceeded the maximum method validation, fortification samples were analyzed to encompass the highest sample residue. Table 6 provides 2006 method validation results. Table 7 provides concurrent fortification recovery results.

For this study, the limit of quantification (LOQ) was established at 0.1 µg/mL detected concentration of MITC. This corresponds to 0.5 µg MITC residue or 0.25 µg/m³ air concentration based on eight hour sample at approximately 4 L/min. The limit of detection (LOD) is approximately one-fifth of this value or 0.05 µg/m³.

D. Interferences

There were no significant interferences in the chromatographic window of retention time for MITC.

E. Confirmatory Techniques

Analytical standards were used to confirm the presence of MITC residues by retention time.

F. Time Required For Analysis

The time required for an experienced person to work up a set of samples (16 samples plus 1 control, 2 fortified samples) for analysis was approximately 2 hours. The time required for the GC analysis of a single sample was approximately 10 minutes.

VI. Results

The analytical method for the measurement of MITC from charcoal cartridges was validated in triplicate at 2.5 µg, 25 µg, and 250 µg total MITC. The method limit of quantitation was estimated to be 0.25 µg/m³ with a limit of detection of 0.05 µg/m³. The method validation and fortification recovery results are summarized in Table 5 and 6, respectively.

During the chemigation air monitoring period, air sampling cartridges were fortified with a known amount of MITC at the FEQL facility and attached to an air sample pump at air flow rates typical of what was used for the field samples. These field spike fortifications serve to show quantitative retention of the MITC on the charcoal. Table 7 provides the MITC recovery of these field spike cartridges. The average MITC recovery from field spikes was 106 % ± 5%.

Residue results from the SKC HiLite air samplers are presented in Table 8 and 9. The average MITC recovery from laboratory fortifications performed with each analytical sample set was 106 % ± 13 % (n=34).

Table 5
2006 MITC Method Validation Results

Matrix	Fortification (μg)	Recovery (%)
1 g cartridge	2.5	106.67
		99.61
		99.45
	25	108.02
		107.76
		109.97
	250	106.82
		101.17
		100.43
Average 1 g Method Validation		104 \pm 4 %
2 g cartridge	2.5	93.76
		92.51
		104.49
	25	107.92
		107.32
		108.01
	250	100.17
		103.03
		98.99
Average 2 g Method Validation		102 \pm 6 %

Table 6
Concurrent Fortification Recovery Results

Fortification (μg)	Recovery Range (%)	Average Recovery (%)
5	112-124 %	121 \pm 4 % n=8
20	113-129 %	121 \pm 6 % n=6
50	89-95 %	93 \pm 3 % n=4
100	92-101 %	97 \pm 3 % n=6
150	93-97 %	94 \pm 1 % n=6
500	89-102 %	95 \pm 6 % n=4
Overall average recovery 105.7 \pm 13.5 %, n=34		

Table 7 Field Spike Recovery Results

Fortification (μg)	Cartridge size	Air sampled (m^3)	MITC Recovered (μg)	Recovery (%)
100	2 g	1.64 (9 hr sample interval)	102.46 (equivalent to 62.7 $\mu\text{g}/\text{m}^3$)	102%
100	2 g	1.64 (9 hr sample interval)	101.12 (equivalent to 61.9 $\mu\text{g}/\text{m}^3$)	101%
100	1 g	0.98 (4 hr sample interval)	110.58 (equivalent to 113.3 $\mu\text{g}/\text{m}^3$)	111%
100	1 g	0.98 (4 hr sample interval)	110.00 (equivalent to 112.7 $\mu\text{g}/\text{m}^3$)	110%

Table 8
Field 1 Chemigation Residue Results

Sample Location	MITC Residue ($\mu\text{g}/\text{m}^3$)							
	F1-A	F1-B	F1-C	F1-D	F1-E	F1-F	F1-G	F1-H
1R	0.86	2.07	14.64	19.72	16.46	11.49	16.75	6.76
1L	1.19	2.54	14.59	19.39	16.76	10.99	14.88	6.69
2R	1.30	2.06	19.58	20.39	15.39	10.86	15.79	7.35
2L	1.34	2.24	19.35	20.61	15.93	10.06	16.41	7.04
3R	0.91	805.50	103.34	79.35	63.78	11.23	17.32	6.57
3L	1.07	775.26	112.69	81.33	65.86	11.70	17.87	6.51
4R	1.04	958.11	124.28	103.83	73.96	13.22	19.63	NS
4L	0.84	987.35	130.38	103.85	82.83	13.83	18.93	NS
5R	NS	14.53	60.30	100.89	74.72	11.49	23.67	6.23
5L	NS	15.62	0.17	107.99	94.49	11.62	21.39	5.96
6R	NS	9.33	65.86	106.24	78.30	10.55	23.05	6.55
6L	NS	9.53	76.73	107.00	81.72	10.61	19.93	6.15
7R	1.04	1.80	89.79	54.26	37.76	52.46	42.95	8.22
7L	1.03	1.61	74.37	52.75	35.88	50.32	40.90	7.92
8R	1.17	2.06	17.79	28.32	25.21	32.79	29.06	6.24
8L	1.23	2.08	23.18	27.38	24.05	24.12	28.90	6.01

NS=No sample

Table 9
Field 2 Shank Injection Residue Results

Sample Location	MITC Residue ($\mu\text{g}/\text{m}^3$)							
	F2-A	F2-B	F2-C	F2-D	F2-E	F2-F	F2-G	F2-H
7R	0.05	6.23	82.09	38.54	36.10	0.83	3.06	59.74
7L	0.06	6.32	86.82	41.78	36.46	0.85	2.99	57.65
8R	0.09	8.01	89.34	26.73	27.33	0.79	2.39	47.66
8L	0.08	8.27	93.58	28.01	26.41	0.76	2.35	42.04
9R	0.06	73.69	115.06	1.67	28.78	6.10	9.27	7.26
9L	0.05	75.91	122.85	1.73	28.09	5.92	8.48	7.99
10R	ND	89.82	135.44	1.52	28.81	8.82	10.59	8.86
10L	ND	91.49	141.16	1.44	30.72	9.46	10.26	8.86
11R	ND	ND	3.71	5.07	0.07	44.26	28.43	0.22
11L	0.05	ND	3.91	4.72	0.07	44.96	28.46	0.16
12R	ND	ND	3.55	5.94	0.08	48.21	30.09	NS
12L	ND	ND	3.36	5.55	0.07	45.78	33.58	NS
13R	0.08	ND	2.45	52.73	3.01	21.55	26.09	11.43
13L	0.06	ND	2.33	50.84	3.02	19.68	25.58	11.76
14R	0.05	ND	2.52	47.67	2.76	20.69	24.16	NS
14L	0.06	ND	2.50	50.37	2.68	19.51	23.95	NS

NS=No sample

ND = Not detected (<LOD, <0.05 $\mu\text{g}/\text{m}^3$)

APPENDIX A: Project Protocol

Field and Analytical Protocol
Project No. FEOL-1106

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PROJECT TITLE: Optimizing Fumigant Efficacy while Minimizing Off-target Volatile Emissions

PROJECT COORDINATOR:

Organization: Food and Environmental Quality Laboratory
Address: 2710 University Drive, Richland WA 99352
Telephone: 509-373-7393

COLLABORATION

Organization: Western Farm Service
Address: 3482 Glade Road, Pasco, WA
Telephone: 509-547-9771

PROJECT DURATION: October 2006 through December 2006

PROJECT SUMMARY

The focus of this proposal targets enhancing efficacy by employing best management practices to reduce fumigant off-gassing by chemigation and soil-incorporated shank injection with compaction. In south Franklin County, WA, a low pressure center pivot system will be used for applying Sectagon 42 (42% metam sodium) to a 33 acre cropping circle. Adjacent, a 119 acre cropping circle with near-identical soil characteristics will be treated with similar application rates by shank injection/soil compaction. The shank event will occur shortly after completion of chemigation. Differences in the efficacy of these two application demonstrations will be evaluated by monitoring near-field MITC emissions at air sampling stations located around the periphery of each field before, during (chemigation only), and up to 4 days after fumigation. This proposed demonstration will provide regional volatilization information for the putative best management practices of chemigation and soil incorporated shank injection for assessing product efficacy. This side-by-side demonstration will also aid growers in evaluating chemigation and soil incorporated shank injection as stewardship strategies for minimizing off-target fumigant emissions especially when deciding on application practices near residential communities.

APPROACH

Field locations: Figure 1 shows locations for the chemigation and soil-incorporated shank injection treatments. Both circles will be rotating from corn into potato production in 2007. Each circle will receive enough irrigation water to bring the field to the desired soil moisture prior to Sectagon 42 application. Specific application information for each site (i.e. weather conditions during application, rate of application, chemigation nozzle packages used, soil depth of shanking, time for completing the application, original observations) and meteorological data will be documented in a *Field Data Book* (see the Field Documentation and Record Keeping section for data book requirements).

Field and Analytical Protocol
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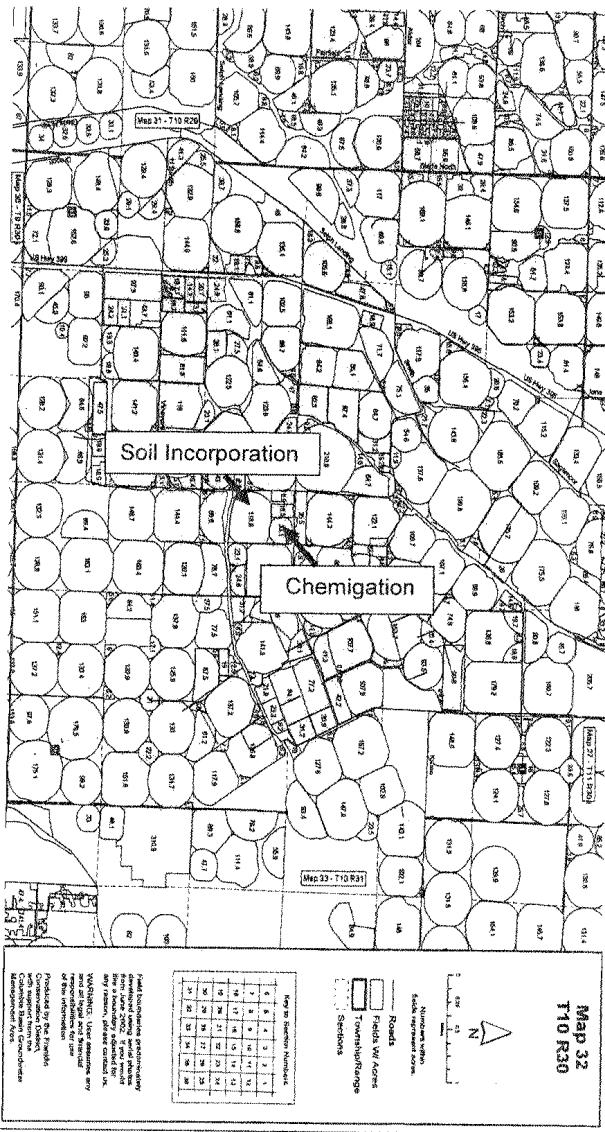


Figure 1: Chemigation and soil-incorporated shank injection locations. Produced by Franklin Conservation District, Washington State.

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Chemigation: Sectagon 42 will be commercially chemigated according to label requirements using ca. 1 inch of water to set the product at a desired soil depth. The anticipated time to complete the application over the 33 acre circle is ca. 36 hours. Application specifics will be documented in the *Field Data Book*.

Soil-incorporated Shank Injection: Western Farm Service will conduct the shank injection with soil compaction to the 119 acre field according to label requirements. The anticipated time to complete this application is ca. 1 day. Application specifics will be documented in the *Field Data Book*.

Air Monitoring: Uniform siting procedures at the two field plots will include positioning a minimum of eight mast air samplers around the periphery of the field (see Figure 2). Air will be monitored pre-application and at discrete intervals up to 4 days post-application.

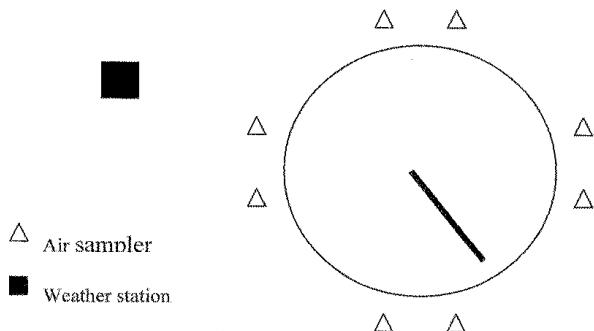


Figure 2: Center pivot air sampler locations

Sampling masts will consist of a cross-arm at approximately 0.5 meter height that can hold two collocated charcoal sampling tubes (each tube will contain either 1-gram or 2-gram coconut charcoal prepared by SKC West, Fullerton, CA) at opposite ends of the cross-arm. SKC Hi Lite® air samplers will be employed for ambient air sampling. The pump flows will be set at ca. 2 Liters/minute, but actual flow will be measured at the start and end of each sampling period using calibrated rotameters. Breakthrough evaluations and field fortifications will be performed shortly before and during the monitoring period to monitor trapping efficiency over the application and post-application sampling interval period. These evaluations will be conducted at the WSU-TriCities facility to minimize background interference.

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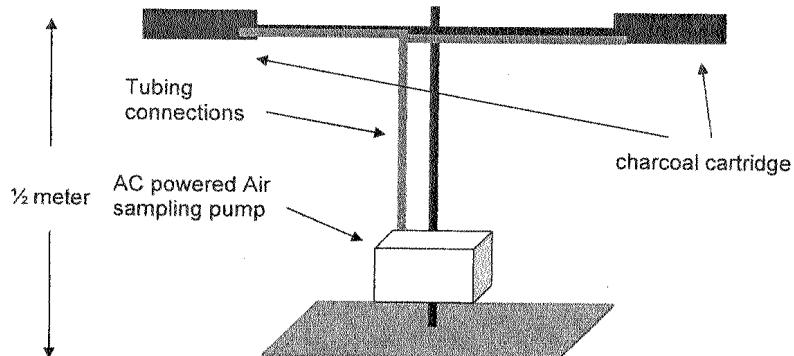


Figure 2: Sample masts with coconut charcoal cartridges

Sampling Frequency and Duration: The sampling masts and meteorological equipment will be operated prior to application, during application, and over a number of 4 to 8 hour sampling intervals up to 4 days post application. One gram charcoal sample cartridges will be used for sampling air to 4-hour intervals at pre-application, during application (chemigation only), and over the first 12-hour post application period. Two gram charcoal sample cartridges will be employed to sample air for up to 8-hours twenty four and forty eight hours post-application.

Proposed Sampling Number

Number of samples: 2 plots x 8 stations x 2 replicates x 6 sample intervals = 192
(Sixteen additional air monitoring samples will be taken during the chemigation event)
(An additional 12 air monitoring samples will be taken for breakthrough and spike recovery evaluations)

Sample Handling and Quality Control: At the end of each sampling period, the sampling media will be capped and uniquely labeled identifying the individual sample. The bags will be stored on blue ice and transported daily to the WSU Food and Environmental Quality Laboratory where the samples will be stored at -80° C prior to analysis. Trip blanks (i.e., no MITC) and chain of custody documentation will accompany each sample shipment. Fortified spikes will be made to the intakes of the air sampling tubes during the period of air monitoring. These tubes will be run outdoors for four (1-gram cartridges) to eight hours (2-gram cartridges) during the air sampling period at the WSU-FEQL to verify quantitative field recovery of vapor-trapped MITC.

Laboratory Analysis: The Food and Environmental Quality Laboratory (FEQL) is a regulatory science 40 CFR Part 160 Good Laboratory Practices (GLP) facility under the direction of Dr. Hebert. Extraction and analytical methods to be used in this evaluation have been previously validated (FEQL, 2006). The Lab will employ a solvent elution method that uses an 80:20 v/v mixture of ethyl acetate/carbon disulfide for extracting MITC from charcoal air sampling tubes. MITC in the solvent extract will be determined using gas chromatography with nitrogen-phosphorus thermionic specific detection. The analytical method will be considered validated if

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recoveries from fortified field samples prepared at various spiking concentrations (in triplicate) range from 70 to 120% and fall within a standard deviation of 20. All steps will be taken to insure sample integrity on an analytical set-by-set basis (i.e., controls, fortifications, calibrations, and linearities). The generated data will be expressed in units of mass recovered to total volume of air sampled ($\mu\text{g m}^{-3}$).

Storage Stability: An 85-day frozen storage stability study has been previously conducted by the WSU-FEQL (FEQL, 2006). It is anticipated that sample analysis will be completed well before this 85-day period.

Statistical Method: Criteria for acceptance of standard curve(s) or other statistical methods shall be determined by the Project Coordinator and documented in the raw data.

Field Documentation and Record Keeping: All operations, data and observations appropriate to this study should be recorded directly and promptly into the FIELD DATA BOOK. General instructions for completion of the field data book can be found on page 2 of this book. This Data Book was designed for collecting field information and serves as an authentic record of fieldwork. It has seven Parts or Chapters containing the following information:

<u>PART</u>	<u>SUBJECT</u>
1	Personnel Log
2	Communications/ Field Chronological Log and Notes
3	Field Trial Site Information/Placement of Air Samplers
4	Air Sampler Calibration/Field Testing Data Sheets
5	Sample Placement and Collection
6	Air Sampler Shipping Information
7	Meteorological Records

Laboratory Documentation and Record Keeping: All operations, data, and observations shall be recorded and must be signed and dated on date of entry. At a minimum, collect and maintain the following raw data:

- Analytical standard(s) receipt, use and disposition records
- Analytical standard(s) storage conditions
- Analytical standard(s) dilution calculations and preparation records
- Sample storage conditions and locations
- Calculation work sheets
- All chromatograms, including those which are not reported
- Chain of custody records
- Name of personnel conducting specific research functions
- Laboratory Writeup Sheets
- Concurrent recovery fortification records

A study file shall be developed and maintained by the FEQL Project Coordinator in conjunction with the analysis. It will contain a copy of the protocol, all pertinent raw data, documentation,

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records, correspondence, and the final analytical summary report. In addition, records of equipment maintenance and calibrations will be kept and periodically archived.

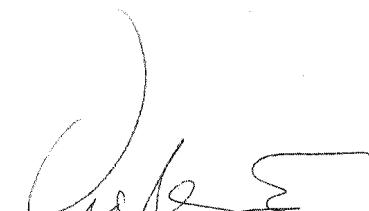
Analytical Summary Report: The analytical summary report to Western Farm Service shall contain, but not be limited to:

- Applicable method validation data
- Applicable storage stability data
- Residue levels for control and treated air and depositional samples with concurrent fortified recoveries
- Meteorological data
- Complete copy of the analytical Working Method
- Clearly presented example calculations or statistical evaluations
- Discussion of results (including purpose of method modifications, sample storage conditions, etc.) -summary data associated with calibration standards (dilution and use records, calibration curves, etc.)

Laboratory Archives: When the final analytical summary report is completed the analytical report and all original field (Field Data Book) and analytical raw data will be retained at the FEQL Testing Laboratory. All original raw data shall be secured in the FEQL Testing Laboratory archives.

REFERENCES

FEQL (2006). MRTC Residential Community Air Assessment; South Franklin County, Washington. Analytic Summary Report FEQL-NG-0605, 52 pp.
<http://feql.wsu.edu/regsci.htm>



Vincent R Hebert
WSU-FEQL Project Coordinator

10-14-06
Date

APPENDIX B: Ag Weather Net Data

Chemigation Weather Data, October 16-23, 2006

Date	Time PST	Avg air temp at 1.6 m (°C)	Avg relative humidity (%)	Avg wind speed at 2 m (m/sec)	Avg wind direction at 2 m (degree)	Total precip. (mm)
10/16/2006	0:00	11.528	81.43	3.116	180	0
10/16/2006	0:15	11.339	82	2.718	260	0
10/16/2006	0:30	11.622	81.4	3.196	180	0
10/16/2006	0:45	11.622	81.57	2.955	259	0
10/16/2006	1:00	11.811	81.75	3.196	272	0
10/16/2006	1:15	11.872	81.11	3.196	271	0
10/16/2006	1:30	11.967	80.97	3.196	262	0
10/16/2006	1:45	12.061	80.88	3.518	266	0
10/16/2006	2:00	12.028	80.6	3.997	266	0
10/16/2006	2:15	12.061	80.91	3.836	267	0
10/16/2006	2:30	12.089	80.33	3.675	264	0
10/16/2006	2:45	11.994	81.19	3.997	266	0
10/16/2006	3:00	11.933	81.07	4.077	265	0
10/16/2006	3:15	11.967	79.74	3.675	265	0
10/16/2006	3:30	12.061	78.23	2.879	266	0
10/16/2006	3:45	12.089	77.6	2.955	262	0
10/16/2006	4:00	11.994	78.23	3.196	258	0
10/16/2006	4:15	11.994	78.18	3.755	180	0
10/16/2006	4:30	11.994	78.14	3.518	180	0
10/16/2006	4:45	11.872	78.53	3.357	262	0
10/16/2006	5:00	11.717	78.76	2.955	261	0
10/16/2006	5:15	11.406	79.43	2.955	180	0
10/16/2006	5:30	11.372	78.92	2.879	264	0
10/16/2006	5:45	11.433	78.67	3.438	262	0
10/16/2006	6:00	11.433	77.86	3.196	256	0
10/16/2006	6:15	11.311	78.99	2.235	249	0
10/16/2006	6:30	11.183	80.76	3.035	249	0
10/16/2006	6:45	11.122	80.98	3.836	259	0
10/16/2006	7:00	11.244	80.02	3.357	254	0
10/16/2006	7:15	11.311	79.86	3.196	252	0
10/16/2006	7:30	11.528	78.21	3.518	259	0
10/16/2006	7:45	11.872	76.5	3.196	258	0
10/16/2006	8:00	12.061	75.23	3.196	252	0
10/16/2006	8:15	12.122	75.03	3.035	255	0
10/16/2006	8:30	12.156	75.54	2.798	249	0
10/16/2006	8:45	12.183	75.77	2.638	253	0
10/16/2006	9:00	12.811	73.78	2.557	263	0
10/16/2006	9:15	13.561	70.15	3.357	180	0
10/16/2006	9:30	13.994	68.42	3.518	261	0
10/16/2006	9:45	14.589	66.51	3.518	165	0

Date	Time PST	Avg air temp at 1.6 m (°C)	Avg relative humidity (%)	Avg wind speed at 2 m (m/sec)	Avg wind direction at 2 m (degree)	Total precip. (mm)
10/16/2006	10:00	15.244	62.64	3.675	268	0
10/16/2006	10:15	15.433	59.6	3.196	249	0
10/16/2006	10:30	15.372	61.25	3.035	263	0
10/16/2006	10:45	15.089	62.04	2.477	252	0
10/16/2006	11:00	15.089	62.15	1.918	248	0
10/16/2006	11:15	15.278	61.6	1.918	271	0
10/16/2006	11:30	15.278	61.88	1.757	257	0
10/16/2006	11:45	15.244	62.68	1.918	251	0
10/16/2006	12:00	16.528	58.55	1.998	245	0
10/16/2006	12:15	16.717	57.13	2.557	249	0
10/16/2006	12:30	17.183	56.21	2.079	245	0
10/16/2006	12:45	17.433	53.56	1.918	259	0
10/16/2006	13:00	17.433	50.78	2.079	270	0
10/16/2006	13:15	16.744	49.43	1.279	295	0
10/16/2006	13:30	16.217	50.91	1.118	280	0
10/16/2006	13:45	16.183	51.05	0.845	323	0
10/16/2006	14:00	16.311	50.83	0.764	323	0
10/16/2006	14:15	16.372	51.29	0	328	0
10/16/2006	14:30	16.406	52.38	0.764	277	0
10/16/2006	14:45	15.967	56.3	0.796	218	0
10/16/2006	15:00	15.372	62.66	0.639	203	0
10/16/2006	15:15	15.244	64.11	1.439	234	0
10/16/2006	15:30	15.061	66.99	1.118	207	0
10/16/2006	15:45	14.933	65.72	1.439	242	0
10/16/2006	16:00	14.933	68.73	2.396	330	0
10/16/2006	16:15	14.372	73.14	2.798	10	0
10/16/2006	16:30	14.122	74.62	2.396	19	0
10/16/2006	16:45	13.561	77.69	2.159	6	0
10/16/2006	17:00	13.156	79.69	1.118	16	0
10/16/2006	17:15	12.872	81.97	0.639	29	0
10/16/2006	17:30	12.744	82.55	0	43	0
10/16/2006	17:45	12.717	82.46	0	33	0
10/16/2006	18:00	12.622	83.27	0	27	0
10/16/2006	18:15	12.561	84.15	0	49	0
10/16/2006	18:30	12.339	87.03	0	50	0
10/16/2006	18:45	12.156	87.64	0	50	0
10/16/2006	19:00	12.156	89.04	0.156	5	0
10/16/2006	19:15	12.061	89.18	0.764	350	0
10/16/2006	19:30	11.872	89.7	0	350	0
10/16/2006	19:45	11.744	90.3	0	349	0
10/16/2006	20:00	11.683	91.01	0	349	0
10/16/2006	20:15	11.622	91.95	0	350	0.254
10/16/2006	20:30	11.433	95.27	0	349	0.254
10/16/2006	20:45	11.183	96.71	0	349	0.254

Date	Time PST	Avg air temp at 1.6 m (°C)	Avg relative humidity (%)	Avg wind speed at 2 m (m/sec)	Avg wind direction at 2 m (degree)	Total precip. (mm)
10/16/2006	21:00	11.061	97.49	0	350	0
10/16/2006	21:15	11.028	99.23	0	346	0
10/16/2006	21:30	10.933	99.12	0	345	0
10/16/2006	21:45	10.933	99.6	0	349	0
10/16/2006	22:00	10.839	100	0	359	0
10/16/2006	22:15	10.744	99.66	0	359	0.254
10/16/2006	22:30	10.683	99.56	0	356	0
10/16/2006	22:45	10.622	98.85	0	352	0
10/16/2006	23:00	10.811	97.92	0	352	0
10/16/2006	23:15	10.872	99.02	0	352	0
10/16/2006	23:30	10.839	99.23	0	16	0
10/16/2006	23:45	10.994	98.74	0	153	0
10/17/2006	0:00	11.061	98.42	0	153	0
10/17/2006	0:15	11.089	98.06	0.156	149	0
10/17/2006	0:30	10.933	98.6	0.156	153	0
10/17/2006	0:45	10.872	98.9	0	156	0
10/17/2006	1:00	10.433	99.56	0.796	35	0
10/17/2006	1:15	10.122	100	0.639	33	0
10/17/2006	1:30	10.217	100	0.156	11	0
10/17/2006	1:45	10.311	100	0.156	9	0
10/17/2006	2:00	10.311	100	0.076	8	0
10/17/2006	2:15	10.311	100	0.076	9	0
10/17/2006	2:30	10.372	100	0.684	341	0
10/17/2006	2:45	10.311	100	0.156	295	0
10/17/2006	3:00	10.217	100	0.156	312	0
10/17/2006	3:15	10.122	100	0.764	327	0
10/17/2006	3:30	9.933	100	0.076	345	0
10/17/2006	3:45	9.811	100	0	346	0
10/17/2006	4:00	9.683	100	0.156	342	0
10/17/2006	4:15	9.622	100	0.845	328	0
10/17/2006	4:30	9.528	100	0.156	319	0
10/17/2006	4:45	9.406	100	0	320	0
10/17/2006	5:00	9.372	100	0.156	321	0
10/17/2006	5:15	9.406	100	0.156	316	0
10/17/2006	5:30	9.494	100	0.845	284	0
10/17/2006	5:45	9.622	100	0.156	293	0
10/17/2006	6:00	9.622	100	0.639	321	0
10/17/2006	6:15	9.561	100	0.156	352	0
10/17/2006	6:30	9.561	99.8	0.684	337	0
10/17/2006	6:45	9.528	99.69	0.764	328	0
10/17/2006	7:00	9.561	99.29	0.845	310	0
10/17/2006	7:15	9.656	98.87	0.764	316	0
10/17/2006	7:30	9.933	97.48	0.559	344	0
10/17/2006	7:45	10.061	95.04	0.796	340	0

Date	Time PST	Avg air temp at 1.6 m (°C)	Avg relative humidity (%)	Avg wind speed at 2 m (m/sec)	Avg wind direction at 2 m (degree)	Total precip. (mm)
10/17/2006	8:00	10.183	94.74	1.118	335	0
10/17/2006	8:15	10.339	93.73	0.957	343	0
10/17/2006	8:30	10.561	92.72	1.118	349	0
10/17/2006	8:45	10.811	90.59	1.515	351	0
10/17/2006	9:00	10.994	89.37	1.918	9	0
10/17/2006	9:15	11.122	88.11	1.757	13	0
10/17/2006	9:30	11.528	85.28	1.918	10	0
10/17/2006	9:45	11.967	83.4	2.079	21	0
10/17/2006	10:00	12.311	81.66	1.918	25	0
10/17/2006	10:15	12.778	79.95	1.757	20	0
10/17/2006	10:30	13.311	77.04	1.757	16	0
10/17/2006	10:45	13.994	75.11	1.676	0	0
10/17/2006	11:00	14.339	73.28	1.279	27	0
10/17/2006	11:15	15.028	70.46	0.796	341	0
10/17/2006	11:30	15.244	65.38	1.757	339	0
10/17/2006	11:45	15.528	63.18	2.079	355	0
10/17/2006	12:00	16.122	61.69	1.757	17	0
10/17/2006	12:15	16.122	60.17	1.757	4	0
10/17/2006	12:30	16.433	59.1	1.918	17	0
10/17/2006	12:45	16.778	56.72	2.159	18	0
10/17/2006	13:00	16.906	56.94	1.757	6	0
10/17/2006	13:15	17.061	55.65	1.359	26	0
10/17/2006	13:30	17.183	54.34	1.439	3	0
10/17/2006	13:45	17.433	53.33	1.676	29	0
10/17/2006	14:00	17.311	52.95	1.279	15	0
10/17/2006	14:15	17.494	51.96	1.279	353	0
10/17/2006	14:30	17.433	52.19	0.957	34	0
10/17/2006	14:45	17.494	51	1.279	327	0
10/17/2006	15:00	17.839	50.3	0.559	351	0
10/17/2006	15:15	17.589	50.26	0.796	49	0
10/17/2006	15:30	17.494	50.73	0.72	5	0
10/17/2006	15:45	17.744	50.53	0.845	320	0
10/17/2006	16:00	17.561	51.41	0.957	216	0
10/17/2006	16:15	17.183	51.49	0.764	232	0
10/17/2006	16:30	16.561	52.93	0.764	249	0
10/17/2006	16:45	15.811	55.92	0.076	243	0
10/17/2006	17:00	15.433	58.09	0.639	213	0
10/17/2006	17:15	14.933	68.59	1.439	216	0
10/17/2006	17:30	14.183	74.86	0.957	228	0
10/17/2006	17:45	13.717	77.65	1.118	243	0
10/17/2006	18:00	13.406	78.75	0.796	245	0
10/17/2006	18:15	13.061	80.12	0.639	236	0
10/17/2006	18:30	12.778	81.31	0.876	238	0
10/17/2006	18:45	12.872	79.97	1.118	239	0

Date	Time PST	Avg air temp at 1.6 m (°C)	Avg relative humidity (%)	Avg wind speed at 2 m (m/sec)	Avg wind direction at 2 m (degree)	Total precip. (mm)
10/17/2006	19:00	12.589	80.78	0.957	250	0
10/17/2006	19:15	12.183	82.53	0.639	260	0
10/17/2006	19:30	11.933	83.23	0.957	257	0
10/17/2006	19:45	12.028	82.79	1.037	251	0
10/17/2006	20:00	11.906	82.47	0.156	247	0
10/17/2006	20:15	10.933	85.35	0.639	42	0
10/17/2006	20:30	9.967	90.81	0.957	82	0
10/17/2006	20:45	9.744	92.68	0.764	98	0
10/17/2006	21:00	9.433	93.29	0.478	94	0
10/17/2006	21:15	9.339	95.45	0.764	116	0
10/17/2006	21:30	9.494	94.78	0.764	109	0
10/17/2006	21:45	9.872	94.79	0.156	108	0
10/17/2006	22:00	9.933	95.05	0	65	0
10/17/2006	22:15	9.994	96.3	0.684	16	0
10/17/2006	22:30	9.994	96.86	0.156	16	0
10/17/2006	22:45	9.933	97.01	0.076	10	0
10/17/2006	23:00	10.183	96.45	0.764	133	0
10/17/2006	23:15	10.467	94.46	0	150	0
10/17/2006	23:30	10.217	94.78	0	149	0
10/17/2006	23:45	10.061	96.21	0.076	89	0
10/18/2006	0:00	10.311	96.16	0.076	79	0
10/18/2006	0:15	10.433	94.37	0.764	209	0
10/18/2006	0:30	10.744	92.88	0.684	190	0
10/18/2006	0:45	10.906	88.26	0.957	253	0
10/18/2006	1:00	11.278	84.12	0.639	229	0
10/18/2006	1:15	10.994	84.65	0.478	222	0
10/18/2006	1:30	11.372	82.32	1.439	221	0
10/18/2006	1:45	11.183	83.22	1.918	211	0
10/18/2006	2:00	10.933	84.72	1.757	213	0
10/18/2006	2:15	10.839	85.4	1.118	230	0
10/18/2006	2:30	10.811	86.18	1.118	219	0
10/18/2006	2:45	10.906	85.76	1.279	218	0
10/18/2006	3:00	10.967	85.61	1.439	220	0
10/18/2006	3:15	10.872	86.39	1.359	222	0
10/18/2006	3:30	10.811	85.46	1.198	233	0
10/18/2006	3:45	10.811	85.5	1.439	220	0
10/18/2006	4:00	10.622	86.74	0.796	235	0
10/18/2006	4:15	10.561	85.84	1.439	237	0
10/18/2006	4:30	10.433	85.97	1.279	239	0
10/18/2006	4:45	10.683	84.32	2.235	257	0
10/18/2006	5:00	10.744	84.07	1.279	257	0
10/18/2006	5:15	10.683	83.78	1.439	256	0
10/18/2006	5:30	10.839	83.01	2.396	259	0
10/18/2006	5:45	10.906	82.8	2.159	249	0

Date	Time PST	Avg air temp at 1.6 m (°C)	Avg relative humidity (%)	Avg wind speed at 2 m (m/sec)	Avg wind direction at 2 m (degree)	Total precip. (mm)
10/18/2006	6:00	10.839	83.2	1.676	235	0
10/18/2006	6:15	10.811	82.67	1.998	237	0
10/18/2006	6:30	10.872	80.83	2.079	246	0
10/18/2006	6:45	10.839	80.73	1.279	237	0
10/18/2006	7:00	10.811	81.13	1.439	253	0
10/18/2006	7:15	10.744	82.01	0.796	221	0
10/18/2006	7:30	10.811	81.76	0.559	242	0
10/18/2006	7:45	10.872	82.32	0.845	262	0
10/18/2006	8:00	11.744	79.57	0.796	225	0
10/18/2006	8:15	12.244	77.12	1.198	248	0
10/18/2006	8:30	12.561	76.51	1.439	261	0
10/18/2006	8:45	13.494	74.12	1.837	256	0
10/18/2006	9:00	13.244	73.85	2.396	263	0
10/18/2006	9:15	13.528	72.63	2.396	247	0
10/18/2006	9:30	13.839	70.73	2.235	242	0
10/18/2006	9:45	14.122	69.12	2.396	250	0
10/18/2006	10:00	14.372	67.46	2.557	238	0
10/18/2006	10:15	15.244	65.31	2.079	251	0
10/18/2006	10:30	15.994	63.53	2.235	235	0
10/18/2006	10:45	16.028	63.61	2.396	228	0
10/18/2006	11:00	16.278	62.35	2.718	225	0
10/18/2006	11:15	16.561	60.72	2.396	232	0
10/18/2006	11:30	16.494	57.29	2.879	271	0
10/18/2006	11:45	16.839	56.5	2.557	254	0
10/18/2006	12:00	16.872	58.66	2.557	235	0
10/18/2006	12:15	16.744	58.32	2.396	235	0
10/18/2006	12:30	16.494	58.28	2.718	275	0
10/18/2006	12:45	16.156	60.45	2.718	260	0
10/18/2006	13:00	16.183	61.68	2.159	281	0
10/18/2006	13:15	16.994	57.22	2.879	280	0
10/18/2006	13:30	16.839	56.9	3.196	283	0
10/18/2006	13:45	16.683	58.61	2.235	291	0
10/18/2006	14:00	16.933	60.11	3.035	266	0
10/18/2006	14:15	17.061	61.27	2.557	247	0
10/18/2006	14:30	16.494	68.37	2.879	233	0
10/18/2006	14:45	15.683	69.4	3.196	258	0
10/18/2006	15:00	15.278	71.96	2.955	258	0
10/18/2006	15:15	15.089	74.56	2.955	241	0
10/18/2006	15:30	15.122	74.47	2.718	246	0
10/18/2006	15:45	15.061	73.66	3.836	257	0
10/18/2006	16:00	14.994	72.66	3.035	250	0
10/18/2006	16:15	14.433	74.76	2.879	251	0
10/18/2006	16:30	14.433	74.98	2.798	247	0
10/18/2006	16:45	14.122	75.79	3.196	256	0

Date	Time PST	Avg air temp at 1.6 m (°C)	Avg relative humidity (%)	Avg wind speed at 2 m (m/sec)	Avg wind direction at 2 m (degree)	Total precip. (mm)
10/18/2006	17:00	13.994	75.24	2.557	253	0
10/18/2006	17:15	13.839	74.21	2.718	256	0
10/18/2006	17:30	13.683	73.31	2.235	258	0
10/18/2006	17:45	13.589	72.88	2.159	262	0
10/18/2006	18:00	13.561	72.45	1.837	258	0
10/18/2006	18:15	13.372	73.08	1.757	265	0
10/18/2006	18:30	13.183	74.13	1.918	262	0
10/18/2006	18:45	12.933	75.51	1.515	266	0
10/18/2006	19:00	12.372	77.6	1.279	262	0
10/18/2006	19:15	12.183	78.01	0.796	251	0
10/18/2006	19:30	12.156	77.33	1.439	249	0
10/18/2006	19:45	12.433	75.06	1.918	246	0
10/18/2006	20:00	12.372	75.09	2.557	254	0
10/18/2006	20:15	12.183	75.89	1.918	257	0
10/18/2006	20:30	11.994	76.54	1.676	254	0
10/18/2006	20:45	12.156	76.12	1.439	246	0
10/18/2006	21:00	12.372	74.96	1.998	243	0
10/18/2006	21:15	12.528	74.46	2.235	240	0
10/18/2006	21:30	12.494	75.59	2.396	246	0
10/18/2006	21:45	12.494	76.46	2.079	245	0
10/18/2006	22:00	12.494	77.13	2.235	243	0
10/18/2006	22:15	12.494	77.76	2.557	243	0
10/18/2006	22:30	12.683	77.35	2.638	250	0
10/18/2006	22:45	12.656	78.05	2.079	250	0
10/18/2006	23:00	12.656	77.38	2.396	250	0
10/18/2006	23:15	12.683	76.83	2.557	249	0
10/18/2006	23:30	12.683	76.38	2.718	254	0
10/18/2006	23:45	12.494	79.6	2.079	242	0
10/18/2006	0:00	10.311	96.16	0.076	79	0
10/19/2006	0:00	12.183	82.95	1.439	240	0
10/19/2006	0:15	11.994	85.28	1.918	232	0
10/19/2006	0:30	11.933	86.96	1.837	229	0
10/19/2006	0:45	11.872	87.92	1.439	236	0
10/19/2006	1:00	11.494	91.61	1.757	246	0.254
10/19/2006	1:15	11.433	92.56	2.235	245	0
10/19/2006	1:30	11.339	93.58	1.918	246	0
10/19/2006	1:45	11.433	93.3	2.079	254	0.254
10/19/2006	2:00	11.433	93.25	1.918	254	0
10/19/2006	2:15	11.811	89.89	2.718	236	0
10/19/2006	2:30	11.967	88.79	1.757	228	0
10/19/2006	2:45	12.061	87.9	2.557	241	0
10/19/2006	3:00	12.183	86.81	2.159	251	0
10/19/2006	3:15	12.244	86.43	1.998	253	0
10/19/2006	3:30	12.244	86.35	1.757	250	0

Date	Time PST	Avg air temp at 1.6 m (°C)	Avg relative humidity (%)	Avg wind speed at 2 m (m/sec)	Avg wind direction at 2 m (degree)	Total precip. (mm)
10/19/2006	3:45	12.244	86.19	1.918	270	0
10/19/2006	4:00	12.061	86.89	1.118	283	0
10/19/2006	4:15	11.933	88.4	1.118	300	0
10/19/2006	4:30	11.622	90.09	0.764	325	0
10/19/2006	4:45	12.339	86.03	1.998	244	0
10/19/2006	5:00	12.433	85.84	1.837	265	0
10/19/2006	5:15	12.467	85.75	1.837	271	0
10/19/2006	5:30	12.561	85.36	1.676	256	0
10/19/2006	5:45	12.494	86.45	0.957	234	0
10/19/2006	6:00	12.433	87.64	1.279	248	0
10/19/2006	6:15	12.372	89.02	1.918	240	0
10/19/2006	6:30	12.244	90.37	1.515	250	0.254
10/19/2006	6:45	12.372	90.07	1.757	250	0
10/19/2006	7:00	12.433	91	1.918	260	0
10/19/2006	7:15	12.244	93.78	0.796	242	0.254
10/19/2006	7:30	12.122	95.5	0.72	260	0.508
10/19/2006	7:45	12.244	96.32	1.439	258	0
10/19/2006	8:00	12.494	95.7	1.757	257	0
10/19/2006	8:15	12.744	95.73	0.957	248	0
10/19/2006	8:30	12.994	94.15	1.757	256	0
10/19/2006	8:45	13.278	93.24	1.757	253	0
10/19/2006	9:00	13.494	91.59	2.396	250	0.254
10/19/2006	9:15	13.561	92.93	1.596	249	0
10/19/2006	9:30	13.872	92.5	1.918	275	0
10/19/2006	9:45	14.683	89.75	1.279	269	0
10/19/2006	10:00	15.811	85.31	1.837	222	0
10/19/2006	10:15	16.244	83.45	2.396	248	0
10/19/2006	10:30	16.406	82.31	2.316	256	0
10/19/2006	10:45	16.933	79.68	3.357	267	0
10/19/2006	11:00	16.811	79.94	2.718	251	0
10/19/2006	11:15	16.744	80.09	2.396	257	0
10/19/2006	11:30	16.872	80.2	2.235	247	0
10/19/2006	11:45	17.183	79.87	2.316	248	0
10/19/2006	12:00	18.122	76.77	2.557	254	0
10/19/2006	12:15	18.467	73.78	3.196	264	0
10/19/2006	12:30	19.122	69.89	3.675	271	0
10/19/2006	12:45	19.656	67.11	3.518	255	0
10/19/2006	13:00	20.183	65.91	4.318	260	0
10/19/2006	13:15	20.372	65.86	4.157	252	0
10/19/2006	13:30	20.811	65.72	3.755	256	0
10/19/2006	13:45	20.433	66.57	4.157	269	0
10/19/2006	14:00	20.561	66.06	4.157	272	0
10/19/2006	14:15	21.122	64.6	3.518	270	0
10/19/2006	14:30	21.122	64.27	4.077	261	0

Date	Time PST	Avg air temp at 1.6 m (°C)	Avg relative humidity (%)	Avg wind speed at 2 m (m/sec)	Avg wind direction at 2 m (degree)	Total precip. (mm)
10/19/2006	14:45	21.122	63.76	4.157	252	0
10/19/2006	15:00	21.061	63.57	3.755	243	0
10/19/2006	15:15	21.311	62.68	2.718	235	0
10/19/2006	15:30	21.372	62.82	3.518	251	0
10/19/2006	15:45	21.25	62.49	3.599	253	0
10/19/2006	16:00	21.217	62.72	3.196	250	0
10/19/2006	16:15	20.906	63.44	3.599	254	0
10/19/2006	16:30	20.278	64.79	4.716	260	0
10/19/2006	16:45	19.906	66.05	4.716	260	0
10/19/2006	17:00	19.5	66.94	4.318	180	0
10/19/2006	17:15	19.122	67.07	3.836	256	0
10/19/2006	17:30	18.683	68.28	4.238	263	0
10/19/2006	17:45	18.156	70.15	4.318	274	0
10/19/2006	18:00	17.744	71.13	3.997	275	0
10/19/2006	18:15	17.433	71.72	3.277	277	0
10/19/2006	18:30	17.244	71.43	3.196	274	0
10/19/2006	18:45	17.217	69.77	3.836	280	0
10/19/2006	19:00	16.933	69.59	3.196	292	0
10/19/2006	19:15	16.372	70.82	0.957	279	0
10/19/2006	19:30	15.994	71.52	0.559	239	0
10/19/2006	19:45	15.622	72.82	0.764	205	0
10/19/2006	20:00	15.156	74.19	1.118	153	0
10/19/2006	20:15	15.406	72.16	1.118	223	0
10/19/2006	20:30	15.778	69.74	2.638	269	0
10/19/2006	20:45	15.744	69.28	2.718	268	0
10/19/2006	21:00	15.311	72.09	2.079	253	0
10/19/2006	21:15	14.872	74.21	0.957	240	0
10/19/2006	21:30	14.122	77.35	0.639	268	0
10/19/2006	21:45	13.217	81.16	0.796	278	0
10/19/2006	22:00	12.744	82.53	0.764	264	0
10/19/2006	22:15	12.028	84.96	0.876	181	0
10/19/2006	22:30	12.372	84.24	1.596	249	0
10/19/2006	22:45	12.433	81.69	1.118	277	0
10/19/2006	23:00	13.744	69.73	0.876	320	0
10/19/2006	23:15	12.872	72.46	0.796	328	0
10/19/2006	23:30	12.839	70.4	1.918	322	0
10/19/2006	23:45	14.183	62.07	3.035	332	0
10/20/2006	0:00	14.217	61.82	3.277	339	0
10/20/2006	0:15	14.061	61.66	3.357	337	0
10/20/2006	0:30	13.561	63.72	2.079	319	0
10/20/2006	0:45	12.872	66.03	1.757	295	0
10/20/2006	1:00	12.872	65.31	2.235	319	0
10/20/2006	1:15	13.122	64.3	3.035	331	0
10/20/2006	1:30	12.561	66.67	2.079	304	0

Date	Time PST	Avg air temp at 1.6 m (°C)	Avg relative humidity (%)	Avg wind speed at 2 m (m/sec)	Avg wind direction at 2 m (degree)	Total precip. (mm)
10/20/2006	1:45	11.683	69.97	1.596	293	0
10/20/2006	2:00	11.994	68.13	1.918	307	0
10/20/2006	2:15	12.089	67.8	2.316	308	0
10/20/2006	2:30	11.811	69.02	2.079	304	0
10/20/2006	2:45	11.622	70.14	2.159	307	0
10/20/2006	3:00	11.683	69.48	2.235	311	0
10/20/2006	3:15	11.561	68.62	1.918	278	0
10/20/2006	3:30	11.122	69.88	1.918	286	0
10/20/2006	3:45	11.183	69.11	1.918	303	0
10/20/2006	4:00	11.311	67.88	2.557	307	0
10/20/2006	4:15	11.244	68.34	2.557	316	0
10/20/2006	4:30	10.872	69.54	2.396	323	0
10/20/2006	4:45	11.622	64.74	2.557	328	0
10/20/2006	5:00	12.372	60.77	2.477	332	0
10/20/2006	5:15	11.683	64.16	0.639	266	0
10/20/2006	5:30	10.339	71.55	0.639	161	0
10/20/2006	5:45	10.778	69.58	1.118	234	0
10/20/2006	6:00	10.372	71.14	0.478	226	0
10/20/2006	6:15	9.994	73.3	0.478	215	0
10/20/2006	6:30	9.967	73.97	0.72	228	0
10/20/2006	6:45	10.122	73.07	0.639	272	0
10/20/2006	7:00	10.028	72.72	1.118	276	0
10/20/2006	7:15	10.061	73.05	0.796	231	0
10/20/2006	7:30	10.433	74.53	0.639	163	0
10/20/2006	7:45	10.717	73.9	0	170	0
10/20/2006	8:00	11.122	74.33	0.156	152	0
10/20/2006	8:15	11.561	73.01	0.639	208	0
10/20/2006	8:30	12.561	66.75	0.639	215	0
10/20/2006	8:45	13.372	62.32	0.639	241	0
10/20/2006	9:00	13.778	60.19	1.037	264	0
10/20/2006	9:15	14.122	59.05	1.757	271	0
10/20/2006	9:30	14.622	57.46	1.439	230	0
10/20/2006	9:45	15.183	54.86	0.957	236	0
10/20/2006	10:00	15.839	51.47	1.439	270	0
10/20/2006	10:15	16.183	50.83	1.439	311	0
10/20/2006	10:30	16.811	48.87	2.159	287	0
10/20/2006	10:45	17.156	47.95	2.079	302	0
10/20/2006	11:00	17.622	45.72	2.235	311	0
10/20/2006	11:15	18.122	43.86	2.557	314	0
10/20/2006	11:30	18.494	42.17	2.079	308	0
10/20/2006	11:45	19	40.23	1.596	321	0
10/20/2006	12:00	19.278	37.5	1.757	350	0
10/20/2006	12:15	19.561	37.05	2.396	331	0
10/20/2006	12:30	19.75	39.23	2.557	327	0

Date	Time PST	Avg air temp at 1.6 m (°C)	Avg relative humidity (%)	Avg wind speed at 2 m (m/sec)	Avg wind direction at 2 m (degree)	Total precip. (mm)
10/20/2006	12:45	19.433	34.3	2.396	50	0
10/20/2006	13:00	19.372	34.28	2.235	23	0
10/20/2006	13:15	20.25	32.77	2.798	18	0
10/20/2006	13:30	20.061	32.5	3.518	12	0
10/20/2006	13:45	20.061	32.03	3.357	27	0
10/20/2006	14:00	19.933	32.79	3.196	57	0
10/20/2006	14:15	20	32.9	2.718	55	0
10/20/2006	14:30	20.028	32.96	2.396	62	0
10/20/2006	14:45	18.906	34.54	1.918	44	0
10/20/2006	15:00	19.406	33.81	1.918	57	0
10/20/2006	15:15	19.5	33.35	1.198	17	0
10/20/2006	15:30	18.494	36	0.957	17	0
10/20/2006	15:45	19.372	35.16	0.957	353	0
10/20/2006	16:00	19.75	33.32	0.957	346	0
10/20/2006	16:15	19.75	34.06	0.639	343	0
10/20/2006	16:30	19.25	36.35	0.639	343	0
10/20/2006	16:45	18.183	39.52	0.156	316	0
10/20/2006	17:00	17.183	41.03	0.478	296	0
10/20/2006	17:15	15.778	47.3	0.845	322	0
10/20/2006	17:30	14.717	51.06	0	332	0
10/20/2006	17:45	14.122	53.14	0	333	0
10/20/2006	18:00	13.872	53.2	0.478	257	0
10/20/2006	18:15	13.622	54.46	0.478	240	0
10/20/2006	18:30	13.311	55.73	0.764	227	0
10/20/2006	18:45	12.528	59.38	0.478	63	0
10/20/2006	19:00	12.967	58.92	0.156	63	0
10/20/2006	19:15	12.244	62.45	0.478	248	0
10/20/2006	19:30	11.494	66.19	0.764	291	0
10/20/2006	19:45	10.994	68.46	0.639	259	0
10/20/2006	20:00	9.311	75.1	0.957	74	0
10/20/2006	20:15	8.183	80.62	1.037	58	0
10/20/2006	20:30	7.933	82.58	0.156	57	0
10/20/2006	20:45	8.622	79.44	0.764	115	0
10/20/2006	21:00	8.811	77.47	0.639	148	0
10/20/2006	21:15	8.061	82.89	0.796	94	0
10/20/2006	21:30	7.217	86.05	0.076	92	0
10/20/2006	21:45	6.811	86.77	0.764	169	0
10/20/2006	22:00	6.244	90.05	0.684	63	0
10/20/2006	22:15	5.994	90.35	0.639	74	0
10/20/2006	22:30	5.906	90.39	0.478	70	0
10/20/2006	22:45	5.089	92.51	0.72	66	0
10/20/2006	23:00	5.217	92.33	0.478	44	0
10/20/2006	23:15	5.183	92.86	0.764	14	0
10/20/2006	23:30	5.156	92.69	0.478	102	0

Date	Time PST	Avg air temp at 1.6 m (°C)	Avg relative humidity (%)	Avg wind speed at 2 m (m/sec)	Avg wind direction at 2 m (degree)	Total precip. (mm)
10/20/2006	23:45	4.656	93.19	0.478	63	0
10/21/2006	0:00	4.433	94.24	0.478	79	0
10/21/2006	0:15	4.183	94.28	0.639	90	0
10/21/2006	0:30	4.683	95.18	0.478	143	0
10/21/2006	0:45	4.244	94.92	0.478	71	0
10/21/2006	1:00	3.75	95.71	0.639	0	0
10/21/2006	1:15	3.872	96.79	0.639	138	0
10/21/2006	1:30	3.778	95.86	0.639	108	0
10/21/2006	1:45	3.622	96.53	0.156	256	0
10/21/2006	2:00	3.622	96.45	0.478	110	0
10/21/2006	2:15	3.183	96.25	0.764	92	0
10/21/2006	2:30	3.494	96.88	0.764	91	0
10/21/2006	2:45	2.933	96.14	0.478	82	0
10/21/2006	3:00	2.244	97.76	0.764	84	0
10/21/2006	3:15	2.433	98.9	0.764	81	0
10/21/2006	3:30	2.183	98.27	0.478	93	0
10/21/2006	3:45	2.122	99.14	0.845	180	0
10/21/2006	4:00	1.683	99.11	0.845	60	0
10/21/2006	4:15	1.839	100	0.478	84	0
10/21/2006	4:30	1.872	99.53	0.478	58	0
10/21/2006	4:45	1.622	99.18	0.156	63	0
10/21/2006	5:00	1.561	99.69	0.156	56	0
10/21/2006	5:15	1.528	99.41	0.764	73	0
10/21/2006	5:30	1.494	99.25	0.764	72	0
10/21/2006	5:45	1.25	98.68	0.156	52	0
10/21/2006	6:00	1.028	98.97	0.156	42	0
10/21/2006	6:15	1.25	99.31	0.076	46	0
10/21/2006	6:30	1	98.43	0	40	0
10/21/2006	6:45	1.25	99.18	0	8	0
10/21/2006	7:00	2.122	96.74	0.156	11	0
10/21/2006	7:15	2.5	96.35	0.764	58	0
10/21/2006	7:30	3.683	94.97	0.156	35	0
10/21/2006	7:45	4.528	90.46	0.845	51	0
10/21/2006	8:00	5.089	87.43	0.72	68	0
10/21/2006	8:15	5.589	84.36	1.198	98	0
10/21/2006	8:30	6.183	81.44	0.639	86	0
10/21/2006	8:45	6.589	81.25	0.957	51	0
10/21/2006	9:00	7.089	80.74	1.118	68	0
10/21/2006	9:15	7.778	77.44	1.596	61	0
10/21/2006	9:30	8.622	72.84	1.118	57	0
10/21/2006	9:45	9.244	70.97	0.876	40	0
10/21/2006	10:00	9.994	67.5	0.559	42	0
10/21/2006	10:15	10.811	64.76	0.764	93	0
10/21/2006	10:30	11.683	62.39	0.156	80	0

Date	Time PST	Avg air temp at 1.6 m (°C)	Avg relative humidity (%)	Avg wind speed at 2 m (m/sec)	Avg wind direction at 2 m (degree)	Total precip. (mm)
10/21/2006	10:45	11.811	62.31	0.764	23	0
10/21/2006	11:00	12.156	61.78	0.764	293	0
10/21/2006	11:15	12.561	61.4	0.957	356	0
10/21/2006	11:30	12.933	61.17	0.796	7	0
10/21/2006	11:45	13.467	60.11	0.764	314	0
10/21/2006	12:00	14.061	59.11	0.72	355	0
10/21/2006	12:15	14.311	58.88	1.279	30	0
10/21/2006	12:30	14.622	57.96	1.118	5	0
10/21/2006	12:45	14.933	57.3	1.118	352	0
10/21/2006	13:00	15.622	55.98	1.037	350	0
10/21/2006	13:15	15.811	55.04	1.118	15	0
10/21/2006	13:30	16.183	51.92	1.118	356	0
10/21/2006	13:45	16.433	48.73	1.439	12	0
10/21/2006	14:00	16.622	47.75	1.279	359	0
10/21/2006	14:15	16.933	44.82	1.596	9	0
10/21/2006	14:30	17.122	43.65	1.837	27	0
10/21/2006	14:45	17.183	43.52	1.439	32	0
10/21/2006	15:00	17.311	43.51	1.439	10	0
10/21/2006	15:15	17.339	43.7	1.439	358	0
10/21/2006	15:30	17.406	43.09	1.596	4	0
10/21/2006	15:45	17.311	44.05	1.515	6	0
10/21/2006	16:00	17.061	45.33	1.515	2	0
10/21/2006	16:15	16.656	46.54	1.279	357	0
10/21/2006	16:30	16.183	47.09	1.118	351	0
10/21/2006	16:45	15.494	49.26	1.037	346	0
10/21/2006	17:00	14.561	52.58	0.72	338	0
10/21/2006	17:15	13.683	55.03	0.764	331	0
10/21/2006	17:30	13.372	56.03	0	331	0
10/21/2006	17:45	13.028	57.8	0	336	0
10/21/2006	18:00	11.656	63.87	0.72	27	0
10/21/2006	18:15	10.906	68.33	0.156	28	0
10/21/2006	18:30	9.622	74.41	0	23	0
10/21/2006	18:45	9.122	77.55	0	21	0
10/21/2006	19:00	8.622	78.41	0	19	0
10/21/2006	19:15	9.183	75.47	0.478	264	0
10/21/2006	19:30	9.061	75.2	0.156	126	0
10/21/2006	19:45	7.906	78.59	0.796	90	0
10/21/2006	20:00	6.683	84.65	0.684	78	0
10/21/2006	20:15	6.372	85.64	0.156	8	0
10/21/2006	20:30	6.906	82.48	0.478	26	0
10/21/2006	20:45	6.061	85.37	0.478	58	0
10/21/2006	21:00	5.839	86.63	0.764	2	0
10/21/2006	21:15	5.278	88.7	0.72	47	0
10/21/2006	21:30	4.839	91.09	0.156	2	0

Date	Time PST	Avg air temp at 1.6 m (°C)	Avg relative humidity (%)	Avg wind speed at 2 m (m/sec)	Avg wind direction at 2 m (degree)	Total precip. (mm)
10/21/2006	21:45	4.778	90.47	0.764	40	0
10/21/2006	22:00	4.933	88.71	0.156	25	0
10/21/2006	22:15	4.744	88.49	0.796	71	0
10/21/2006	22:30	4.122	90.31	0.478	54	0
10/21/2006	22:45	3.994	91.32	0	356	0
10/21/2006	23:00	4.061	90.81	0.639	55	0
10/21/2006	23:15	3.839	90.91	0.156	69	0
10/21/2006	23:30	3.589	92.02	0.559	74	0
10/21/2006	23:45	3.339	91.6	0.156	79	0
10/22/2006	0:00	2.683	92.61	0.764	60	0
10/22/2006	0:15	2.061	95.21	0.764	58	0
10/22/2006	0:30	1.811	97	0.764	52	0
10/22/2006	0:45	2.061	98.33	0.156	55	0
10/22/2006	1:00	2.339	96.67	0.156	269	0
10/22/2006	1:15	2.061	96.22	0	270	0
10/22/2006	1:30	1.717	96.33	0.156	345	0
10/22/2006	1:45	1.467	97.45	0.478	76	0
10/22/2006	2:00	1.217	97.9	0.156	79	0
10/22/2006	2:15	1.25	98.98	0.076	258	0
10/22/2006	2:30	1.311	99.51	0.156	165	0
10/22/2006	2:45	1.494	99.78	0.156	300	0
10/22/2006	3:00	1.778	99.34	0	81	0
10/22/2006	3:15	1.778	97.46	0	80	0
10/22/2006	3:30	1.183	97.16	0.076	79	0
10/22/2006	3:45	1.467	99.37	0.076	123	0
10/22/2006	4:00	1.467	97.73	0	147	0
10/22/2006	4:15	2.122	98.35	0.72	117	0
10/22/2006	4:30	2.122	95.75	0.076	70	0
10/22/2006	4:45	0.683	97.58	0.076	310	0
10/22/2006	5:00	1.183	100	0	309	0
10/22/2006	5:15	1.622	100	0.156	25	0
10/22/2006	5:30	1.622	98.2	0.478	88	0
10/22/2006	5:45	0.778	97.75	0.156	67	0
10/22/2006	6:00	0.25	98.98	0.156	80	0
10/22/2006	6:15	0.122	99.7	0.764	93	0
10/22/2006	6:30	0	100	0	327	0
10/22/2006	6:45	0.061	100	0	37	0
10/22/2006	7:00	0.589	100	0	9	0
10/22/2006	7:15	1.589	99.89	0.156	349	0
10/22/2006	7:30	2.467	98.31	0.639	14	0
10/22/2006	7:45	2.872	95.4	0.957	19	0
10/22/2006	8:00	3.433	94.89	1.118	23	0
10/22/2006	8:15	3.75	92.92	1.676	35	0
10/22/2006	8:30	3.933	91.67	1.439	30	0

Date	Time PST	Avg air temp at 1.6 m (°C)	Avg relative humidity (%)	Avg wind speed at 2 m (m/sec)	Avg wind direction at 2 m (degree)	Total precip. (mm)
10/22/2006	8:45	4.528	89.97	1.118	15	0
10/22/2006	9:00	5.183	87.45	1.198	345	0
10/22/2006	9:15	5.839	83.42	1.515	332	0
10/22/2006	9:30	6.683	82.08	1.757	337	0
10/22/2006	9:45	7.372	80.25	1.596	347	0
10/22/2006	10:00	7.872	78.17	1.757	329	0
10/22/2006	10:15	8.244	77.56	1.439	332	0
10/22/2006	10:30	8.906	75.65	1.118	10	0
10/22/2006	10:45	9.278	74.24	1.279	60	0
10/22/2006	11:00	9.656	73.68	1.118	56	0
10/22/2006	11:15	10.061	72.59	0.957	14	0
10/22/2006	11:30	10.589	70.89	0.72	24	0
10/22/2006	11:45	11.183	69.03	0.957	18	0
10/22/2006	12:00	11.494	68.48	1.279	6	0
10/22/2006	12:15	12.089	66.75	1.037	20	0
10/22/2006	12:30	12.744	64.41	1.515	19	0
10/22/2006	12:45	12.967	63.72	1.439	11	0
10/22/2006	13:00	13.561	61.77	1.439	14	0
10/22/2006	13:15	13.994	59.74	1.596	26	0
10/22/2006	13:30	14.183	57.94	1.596	351	0
10/22/2006	13:45	14.561	57.57	1.676	24	0
10/22/2006	14:00	14.561	56.7	1.757	25	0
10/22/2006	14:15	14.872	55.8	1.439	18	0
10/22/2006	14:30	15.122	55.33	1.118	4	0
10/22/2006	14:45	15.122	55.5	1.037	10	0
10/22/2006	15:00	15.183	55.04	1.279	13	0
10/22/2006	15:15	15.183	54.61	1.198	6	0
10/22/2006	15:30	15.217	54.77	1.037	17	0
10/22/2006	15:45	15.372	54.65	0.478	351	0
10/22/2006	16:00	15.122	55.72	0.639	354	0
10/22/2006	16:15	15.028	56.13	0.156	344	0
10/22/2006	16:30	15.528	54.5	0	335	0
10/22/2006	16:45	15.061	55.13	0	334	0
10/22/2006	17:00	13.717	59.79	0	325	0
10/22/2006	17:15	12.933	63.3	0	270	0
10/22/2006	17:30	12.122	66.73	0.156	251	0
10/22/2006	17:45	10.933	72.36	0.764	256	0
10/22/2006	18:00	10.839	74.1	0.796	270	0
10/22/2006	18:15	9.994	76.95	0	281	0
10/22/2006	18:30	9.872	78.76	0.478	242	0
10/22/2006	18:45	10.183	76.83	0.478	230	0
10/22/2006	19:00	9.494	79.26	0.076	260	0
10/22/2006	19:15	8.433	83.96	0	358	0
10/22/2006	19:30	7.872	85.54	0	358	0

Date	Time PST	Avg air temp at 1.6 m (°C)	Avg relative humidity (%)	Avg wind speed at 2 m (m/sec)	Avg wind direction at 2 m (degree)	Total precip. (mm)
10/22/2006	19:45	7.278	86.71	0	358	0
10/22/2006	20:00	6.528	87.95	0.639	72	0
10/22/2006	20:15	5.872	90.26	0.764	71	0
10/22/2006	20:30	5.717	92.59	0.845	85	0
10/22/2006	20:45	5.75	92.08	0.684	78	0
10/22/2006	21:00	4.839	95.26	0.639	86	0
10/22/2006	21:15	4.717	95.75	0.639	98	0
10/22/2006	21:30	4.467	94.03	0.478	48	0
10/22/2006	21:45	4.089	96.1	0.156	54	0
10/22/2006	22:00	3.933	98.04	0.639	87	0
10/22/2006	22:15	3.656	98.44	0.478	73	0
10/22/2006	22:30	3.25	98.93	0.639	93	0
10/22/2006	22:45	3.061	99.51	0.478	90	0
10/22/2006	23:00	2.994	99.13	0.684	67	0
10/22/2006	23:15	2.811	99.29	0.639	90	0
10/22/2006	23:30	2.406	99.53	0.156	180	0
10/22/2006	23:45	2.278	99.27	0.478	63	0
10/23/2006	0:00	2.967	100	0.764	100	0
10/23/2006	0:15	2.656	98.43	0.559	83	0
10/23/2006	0:30	2.122	99.41	0.764	60	0
10/23/2006	0:45	2	99.87	0.639	74	0
10/23/2006	1:00	1.872	100	0.478	79	0
10/23/2006	1:15	1.906	100	0.478	79	0
10/23/2006	1:30	1.933	100	0.639	79	0
10/23/2006	1:45	1.906	100	0.72	43	0
10/23/2006	2:00	2.183	100	0.72	87	0
10/23/2006	2:15	1.967	100	0.156	98	0
10/23/2006	2:30	1.683	100	0.156	90	0
10/23/2006	2:45	1.494	100	0.764	69	0
10/23/2006	3:00	1.433	100	0.478	64	0
10/23/2006	3:15	1.433	100	0.478	86	0
10/23/2006	3:30	1.372	100	0.764	180	0
10/23/2006	3:45	1.467	100	0.478	78	0
10/23/2006	4:00	1.372	100	0.845	180	0
10/23/2006	4:15	1.25	100	0.559	83	0
10/23/2006	4:30	1.061	100	0.764	81	0
10/23/2006	4:45	1.25	100	0.845	84	0
10/23/2006	5:00	1.372	100	0.478	78	0
10/23/2006	5:15	1.561	100	0.478	87	0
10/23/2006	5:30	1.494	100	0.764	64	0
10/23/2006	5:45	1.589	100	0.764	67	0
10/23/2006	6:00	1.811	100	0.156	71	0
10/23/2006	6:15	1.683	100	0.156	52	0
10/23/2006	6:30	2.089	100	0.478	102	0

Date	Time PST	Avg air temp at 1.6 m (°C)	Avg relative humidity (%)	Avg wind speed at 2 m (m/sec)	Avg wind direction at 2 m (degree)	Total precip. (mm)
10/23/2006	6:45	1.872	100	0.156	80	0
10/23/2006	7:00	1.683	100	0.684	54	0
10/23/2006	7:15	1.811	100	0	46	0
10/23/2006	7:30	2.244	100	0	50	0
10/23/2006	7:45	3.339	100	0.156	69	0
10/23/2006	8:00	4.339	99.63	0.156	78	0
10/23/2006	8:15	4.967	97.04	0.764	61	0
10/23/2006	8:30	5.839	94.3	0.478	58	0
10/23/2006	8:45	6.494	92.46	0.72	47	0
10/23/2006	9:00	7.683	89.62	0.764	32	0
10/23/2006	9:15	8.561	87.61	0.957	8	0
10/23/2006	9:30	9.156	85.58	0.876	3	0
10/23/2006	9:45	9.811	82.6	0.639	12	0
10/23/2006	10:00	10.372	78.16	0.796	341	0
10/23/2006	10:15	10.906	75.17	0.639	322	0
10/23/2006	10:30	11.494	72.93	1.118	287	0
10/23/2006	10:45	12.061	71.49	0.478	346	0
10/23/2006	11:00	12.561	68.9	0.639	351	0
10/23/2006	11:15	12.933	66.89	0.796	324	0
10/23/2006	11:30	13.528	63.34	0.478	260	0
10/23/2006	11:45	14.061	61.26	0.957	348	0
10/23/2006	12:00	14.217	59.39	1.118	333	0
10/23/2006	12:15	14.433	58.53	1.279	317	0
10/23/2006	12:30	14.683	57.42	1.439	330	0
10/23/2006	12:45	14.683	57.29	1.596	347	0
10/23/2006	13:00	14.967	58.53	1.118	25	0
10/23/2006	13:15	15.217	60.68	1.439	2	0
10/23/2006	13:30	15.683	58.56	1.439	19	0
10/23/2006	13:45	15.656	57.88	1.596	14	0
10/23/2006	14:00	15.994	56.13	1.359	19	0
10/23/2006	14:15	15.967	55.31	0.957	24	0
10/23/2006	14:30	15.872	55.37	1.359	12	0
10/23/2006	14:45	16.061	53.85	1.359	105	0
10/23/2006	15:00	16.183	53.73	0.478	17	0
10/23/2006	15:15	16.122	54.79	0.559	13	0
10/23/2006	15:30	16.217	54.66	0.764	357	0
10/23/2006	15:45	16.028	54.78	0.156	39	0
10/23/2006	16:00	16.061	54.96	0.076	29	0
10/23/2006	16:15	16.028	54.91	0	2	0
10/23/2006	16:30	15.872	55.16	0	343	0
10/23/2006	16:45	14.811	56.84	0	144	0
10/23/2006	17:00	14.061	59.66	0	150	0
10/23/2006	17:15	13.406	61.84	0	172	0
10/23/2006	17:30	12.183	68.5	0	247	0

Date	Time PST	Avg air temp at 1.6 m (°C)	Avg relative humidity (%)	Avg wind speed at 2 m (m/sec)	Avg wind direction at 2 m (degree)	Total precip. (mm)
10/23/2006	17:45	11.183	74.65	0	274	0
10/23/2006	18:00	10.811	75.98	0	274	0
10/23/2006	18:15	10.339	77.15	0	274	0
10/23/2006	18:30	9.872	78.75	0	275	0
10/23/2006	18:45	9.156	81.49	0.076	273	0
10/23/2006	19:00	9.089	83.97	0.478	93	0
10/23/2006	19:15	8.683	84.49	0	89	0
10/23/2006	19:30	8.744	84.51	0	89	0
10/23/2006	19:45	8.244	86.57	0.156	74	0
10/23/2006	20:00	7.494	90.1	0.478	65	0
10/23/2006	20:15	7.244	92.52	0.639	71	0
10/23/2006	20:30	7.217	93.83	0.639	57	0
10/23/2006	20:45	7.183	94.02	0.764	50	0
10/23/2006	21:00	7.244	94.07	0	56	0
10/23/2006	21:15	7.339	92.87	0	56	0
10/23/2006	21:30	7.183	93.25	0	55	0
10/23/2006	21:45	7.089	93.27	0.076	56	0
10/23/2006	22:00	6.839	93.79	0.478	57	0
10/23/2006	22:15	6.589	96.19	0.764	89	0
10/23/2006	22:30	6.778	95.27	0.156	102	0
10/23/2006	22:45	6.528	94.66	0.684	80	0
10/23/2006	23:00	6.528	96.54	0.764	82	0
10/23/2006	23:15	6.183	95.33	0.478	71	0
10/23/2006	23:30	5.75	97.39	0.478	88	0
10/23/2006	23:45	5.528	97.84	0.478	73	0

Shank Injection Ag Weather Net Data, November 13-20, 2006

Date	Time PST	Avg air temp at 1.6 m (°C)	Avg relative humidity (%)	Avg wind speed at 2 m (m/sec)	Avg wind direction at 2 m (degree)	Total precip. (mm)
11/13/2006	0:00	9.622	78.07	2.879	187	0
11/13/2006	0:15	10.028	75.1	2.718	182	0
11/13/2006	0:30	10.433	72.55	3.196	206	0
11/13/2006	0:45	11.061	68.35	5.436	214	0
11/13/2006	1:00	11.278	67.2	5.436	214	0
11/13/2006	1:15	11.717	65.17	5.914	217	0
11/13/2006	1:30	11.744	65.85	5.275	215	0
11/13/2006	1:45	11.811	67.53	5.758	226	0
11/13/2006	2:00	12.217	67.36	6.875	234	0
11/13/2006	2:15	12.589	65.54	7.515	250	0
11/13/2006	2:30	12.906	64.36	7.117	246	0
11/13/2006	2:45	12.622	65.61	6.156	252	0
11/13/2006	3:00	12.372	66.03	5.914	248	0
11/13/2006	3:15	12.061	66.5	6.478	246	0
11/13/2006	3:30	11.778	66.11	8.395	250	0
11/13/2006	3:45	11.872	66.21	8.154	252	0
11/13/2006	4:00	12.028	65.62	8.315	246	0
11/13/2006	4:15	12.028	66.27	7.998	249	0
11/13/2006	4:30	11.933	66.67	8.154	251	0
11/13/2006	4:45	11.811	67.07	7.036	248	0
11/13/2006	5:00	11.589	67.22	7.354	248	0
11/13/2006	5:15	11.278	68.06	6.236	256	0
11/13/2006	5:30	11.061	69.28	6.478	255	0
11/13/2006	5:45	10.994	69.95	5.356	251	0
11/13/2006	6:00	10.906	68.61	5.758	257	0
11/13/2006	6:15	10.717	69.79	7.676	251	0
11/13/2006	6:30	10.683	68.71	7.036	258	0
11/13/2006	6:45	10.561	68.1	5.914	250	0
11/13/2006	7:00	10.183	71.11	5.119	247	0
11/13/2006	7:15	10.061	70.45	4.555	247	0
11/13/2006	7:30	9.872	70.29	2.879	241	0
11/13/2006	7:45	9.994	67.16	3.035	249	0
11/13/2006	8:00	10.217	65.94	2.718	246	0
11/13/2006	8:15	10.061	69.84	1.837	210	0
11/13/2006	8:30	10.433	68.91	1.676	208	0
11/13/2006	8:45	10.811	66.82	2.235	253	0
11/13/2006	9:00	11.183	64.79	2.638	262	0
11/13/2006	9:15	11.217	64.54	2.718	239	0
11/13/2006	9:30	11.278	62.52	3.196	244	0
11/13/2006	9:45	11.244	63.26	2.638	236	0
11/13/2006	10:00	11.622	62.86	2.557	246	0
11/13/2006	10:15	11.933	61.42	2.879	260	0

Date	Time PST	Avg air temp at 1.6 m (°C)	Avg relative humidity (%)	Avg wind speed at 2 m (m/sec)	Avg wind direction at 2 m (degree)	Total precip. (mm)
11/13/2006	10:30	12.183	60.85	2.079	256	0
11/13/2006	10:45	12.244	59.61	2.079	260	0
11/13/2006	11:00	12.906	57.63	2.718	245	0
11/13/2006	11:15	13.061	57.39	3.196	223	0
11/13/2006	11:30	12.933	57.48	3.518	233	0
11/13/2006	11:45	12.744	58.8	3.518	236	0
11/13/2006	12:00	12.589	60.14	2.879	221	0
11/13/2006	12:15	12.494	60.77	2.879	219	0
11/13/2006	12:30	12.622	59.37	3.035	217	0
11/13/2006	12:45	12.906	58.86	2.718	226	0
11/13/2006	13:00	13.061	58.17	3.035	240	0
11/13/2006	13:15	12.967	58.77	3.357	232	0
11/13/2006	13:30	12.872	58.99	3.997	232	0
11/13/2006	13:45	12.839	59.12	2.879	221	0
11/13/2006	14:00	12.872	59.48	2.557	220	0
11/13/2006	14:15	12.811	60.36	2.396	218	0
11/13/2006	14:30	12.839	58.8	2.557	234	0
11/13/2006	14:45	12.811	57.05	3.438	239	0
11/13/2006	15:00	12.561	59.33	3.116	241	0
11/13/2006	15:15	12.311	60.38	3.518	242	0
11/13/2006	15:30	12.122	60.61	3.675	180	0
11/13/2006	15:45	11.811	60.93	3.599	249	0
11/13/2006	16:00	11.494	62.38	3.357	247	0
11/13/2006	16:15	11.278	63.65	2.879	239	0
11/13/2006	16:30	10.994	64.94	3.196	241	0
11/13/2006	16:45	10.906	64.69	3.357	244	0
11/13/2006	17:00	10.933	63.73	2.718	255	0
11/13/2006	17:15	10.683	64.82	2.396	266	0
11/13/2006	17:30	10.561	65.93	2.477	248	0
11/13/2006	17:45	10.372	66.75	3.277	247	0
11/13/2006	18:00	10.122	68.39	3.196	248	0
11/13/2006	18:15	10.061	68.32	3.277	248	0
11/13/2006	18:30	9.561	72.63	3.357	237	0
11/13/2006	18:45	9.372	74.11	3.196	245	0
11/13/2006	19:00	9.561	72.27	3.836	256	0
11/13/2006	19:15	9.906	69.86	4.077	254	0
11/13/2006	19:30	9.967	69.6	3.116	254	0
11/13/2006	19:45	9.656	72.51	3.196	269	0
11/13/2006	20:00	9.589	72.63	3.196	280	0
11/13/2006	20:15	9.683	72.36	3.836	282	0
11/13/2006	20:30	9.433	74.56	3.675	288	0
11/13/2006	20:45	9.406	75.16	3.357	288	0
11/13/2006	21:00	9.278	76.24	4.157	286	0
11/13/2006	21:15	9.183	75.85	2.879	274	0

Date	Time PST	Avg air temp at 1.6 m (°C)	Avg relative humidity (%)	Avg wind speed at 2 m (m/sec)	Avg wind direction at 2 m (degree)	Total precip. (mm)
11/13/2006	21:30	9.183	76.58	2.718	266	0
11/13/2006	21:45	9.089	76.04	1.918	262	0
11/13/2006	22:00	8.906	76.32	2.159	290	0
11/13/2006	22:15	8.656	77.47	2.557	278	0
11/13/2006	22:30	8.933	76.36	3.755	277	0
11/13/2006	22:45	8.683	78.05	3.196	285	0
11/13/2006	23:00	8.494	76.59	3.357	291	0
11/13/2006	23:15	8.372	75.62	2.879	296	0
11/13/2006	23:30	8.061	75.97	2.079	270	0
11/13/2006	23:45	7.872	75.25	2.557	278	0
11/14/2006	0:00	7.683	74.07	2.557	180	0
11/14/2006	0:15	7.372	72.94	1.918	286	0
11/14/2006	0:30	6.744	75.08	1.596	262	0
11/14/2006	0:45	6.839	72	1.998	259	0
11/14/2006	1:00	6.433	73.05	1.439	266	0
11/14/2006	1:15	6.311	70.85	0.957	229	0
11/14/2006	1:30	6.744	67.1	2.079	215	0
11/14/2006	1:45	6.778	65.81	1.439	214	0
11/14/2006	2:00	6.406	67.08	1.757	234	0
11/14/2006	2:15	6.339	71.84	2.235	217	0
11/14/2006	2:30	6.872	65.64	1.676	239	0
11/14/2006	2:45	6.406	67.24	1.279	251	0
11/14/2006	3:00	5.872	68.28	1.676	244	0
11/14/2006	3:15	5.528	68.64	1.359	262	0
11/14/2006	3:30	5.122	68.52	1.118	249	0
11/14/2006	3:45	5.811	63.96	1.596	258	0
11/14/2006	4:00	5.656	64.37	1.757	257	0
11/14/2006	4:15	5.717	64.33	1.515	256	0
11/14/2006	4:30	5.406	64.31	1.439	252	0
11/14/2006	4:45	5.906	62.28	1.918	273	0
11/14/2006	5:00	5.622	64.34	2.159	279	0
11/14/2006	5:15	5.622	69.44	2.718	280	0
11/14/2006	5:30	5.656	71.82	2.557	280	0
11/14/2006	5:45	5.339	73.16	2.079	276	0
11/14/2006	6:00	5.217	73.82	1.918	272	0
11/14/2006	6:15	4.933	75.52	2.079	282	0
11/14/2006	6:30	5.217	74.37	2.718	273	0
11/14/2006	6:45	4.994	75.21	1.439	281	0
11/14/2006	7:00	4.589	77.26	1.515	261	0
11/14/2006	7:15	4.717	76.23	1.279	234	0
11/14/2006	7:30	4.811	76.68	1.439	250	0
11/14/2006	7:45	5.528	75.24	1.439	254	0
11/14/2006	8:00	6.217	73.92	1.198	255	0
11/14/2006	8:15	6.811	72.5	1.596	273	0

Date	Time PST	Avg air temp at 1.6 m (°C)	Avg relative humidity (%)	Avg wind speed at 2 m (m/sec)	Avg wind direction at 2 m (degree)	Total precip. (mm)
11/14/2006	8:30	7.217	70.69	1.359	247	0
11/14/2006	8:45	7.778	70.34	1.757	240	0
11/14/2006	9:00	8.061	69.45	1.757	254	0
11/14/2006	9:15	8.778	62.77	1.998	265	0
11/14/2006	9:30	9.278	60.46	1.515	251	0
11/14/2006	9:45	9.561	57.05	2.079	296	0
11/14/2006	10:00	10.061	53.94	1.837	272	0
11/14/2006	10:15	10.406	51.81	1.676	247	0
11/14/2006	10:30	10.744	49.82	1.198	238	0
11/14/2006	10:45	10.967	48.47	1.439	239	0
11/14/2006	11:00	10.494	50.18	2.396	258	0
11/14/2006	11:15	10.372	51.93	2.557	264	0
11/14/2006	11:30	10.494	51.07	2.079	180	0
11/14/2006	11:45	10.872	54.57	1.757	250	0
11/14/2006	12:00	10.811	62.46	2.638	230	0
11/14/2006	12:15	11.183	60.99	2.235	223	0
11/14/2006	12:30	11.933	54.47	2.316	242	0
11/14/2006	12:45	12.183	49.68	2.557	255	0
11/14/2006	13:00	12.061	50	2.718	280	0
11/14/2006	13:15	11.906	50.93	2.638	265	0
11/14/2006	13:30	11.933	51.82	2.718	269	0
11/14/2006	13:45	11.622	52.07	2.718	259	0
11/14/2006	14:00	11.622	55.71	2.396	236	0
11/14/2006	14:15	11.561	55.87	2.477	245	0
11/14/2006	14:30	11.906	55.16	2.159	233	0
11/14/2006	14:45	11.967	55.38	1.439	242	0
11/14/2006	15:00	11.872	54.47	1.439	244	0
11/14/2006	15:15	11.622	55.42	2.235	234	0
11/14/2006	15:30	11.311	55.69	1.837	235	0
11/14/2006	15:45	11.089	56.08	1.676	248	0
11/14/2006	16:00	10.717	57.56	1.439	244	0
11/14/2006	16:15	10.433	58.21	1.515	239	0
11/14/2006	16:30	10.183	58.92	1.439	239	0
11/14/2006	16:45	9.994	60.62	1.279	254	0
11/14/2006	17:00	9.744	62.32	1.118	241	0
11/14/2006	17:15	9.561	63.64	0.957	230	0
11/14/2006	17:30	9.311	65.32	0.478	212	0
11/14/2006	17:45	9.122	66.43	0.796	178	0
11/14/2006	18:00	8.967	66.79	0.796	180	0
11/14/2006	18:15	8.561	68.87	1.118	188	0
11/14/2006	18:30	8.339	69.87	0.957	193	0
11/14/2006	18:45	8.372	69.5	0.796	228	0
11/14/2006	19:00	8.339	68.19	0.796	219	0
11/14/2006	19:15	8.122	70.01	0.796	187	0

Date	Time PST	Avg air temp at 1.6 m (°C)	Avg relative humidity (%)	Avg wind speed at 2 m (m/sec)	Avg wind direction at 2 m (degree)	Total precip. (mm)
11/14/2006	19:30	7.778	72.22	0.796	174	0
11/14/2006	19:45	7.656	72.26	0.639	176	0
11/14/2006	20:00	7.311	72.91	0.639	172	0
11/14/2006	20:15	7.089	73.6	0.559	171	0
11/14/2006	20:30	6.967	74.16	0.639	162	0
11/14/2006	20:45	6.339	76.67	0.156	79	0
11/14/2006	21:00	5.183	83.53	0.478	102	0
11/14/2006	21:15	6.156	83.02	0.957	150	0
11/14/2006	21:30	6.589	79.37	1.279	149	0
11/14/2006	21:45	6.622	77.23	0.876	166	0
11/14/2006	22:00	6.561	77.13	0.559	163	0
11/14/2006	22:15	6.156	79.52	0.796	99	0
11/14/2006	22:30	4.967	86.12	0.796	94	0
11/14/2006	22:45	4.967	86.24	1.118	113	0
11/14/2006	23:00	6.372	77.69	1.439	128	0
11/14/2006	23:15	6.778	74.09	1.279	143	0
11/14/2006	23:30	7.061	70.32	1.279	150	0
11/14/2006	23:45	7.156	69.41	0.72	103	0
11/15/2006	0:00	6.089	79.33	0.639	48	0
11/15/2006	0:15	6.089	78.18	0.764	82	0
11/15/2006	0:30	6.244	76.64	0.764	101	0
11/15/2006	0:45	5.622	81.73	0.478	75	0
11/15/2006	1:00	5.339	83.92	0.478	64	0
11/15/2006	1:15	5.372	83.68	0	62	0
11/15/2006	1:30	5.406	83	0	62	0
11/15/2006	1:45	5.494	83.67	0.764	99	0
11/15/2006	2:00	5.311	85.07	0.764	360	0
11/15/2006	2:15	5.061	87.4	0.478	64	0
11/15/2006	2:30	4.906	88.58	0.156	60	0
11/15/2006	2:45	4.906	87.28	0.156	67	0
11/15/2006	3:00	4.994	85.52	0.156	280	0
11/15/2006	3:15	5.311	82.06	0.156	284	0
11/15/2006	3:30	4.744	86.35	0.764	53	0
11/15/2006	3:45	4.994	85.54	0.156	21	0
11/15/2006	4:00	4.906	88.26	0	313	0
11/15/2006	4:15	5.122	86.4	0.076	314	0
11/15/2006	4:30	5.372	89.13	0.684	356	0
11/15/2006	4:45	5.467	91.38	0.478	90	0
11/15/2006	5:00	5.872	87.51	1.596	115	0
11/15/2006	5:15	7.372	73.69	1.118	169	0
11/15/2006	5:30	7.717	73.13	1.118	194	0
11/15/2006	5:45	7.872	72.05	0.796	177	0
11/15/2006	6:00	8.122	71.03	1.037	176	0
11/15/2006	6:15	8.156	72.14	0.639	169	0

Date	Time PST	Avg air temp at 1.6 m (°C)	Avg relative humidity (%)	Avg wind speed at 2 m (m/sec)	Avg wind direction at 2 m (degree)	Total precip. (mm)
11/15/2006	6:30	8.122	72.95	0.796	162	0
11/15/2006	6:45	8.183	70.82	0.957	170	0
11/15/2006	7:00	8.278	70.54	0.559	162	0
11/15/2006	7:15	8.183	71.61	0.845	167	0
11/15/2006	7:30	8.183	73.29	0.796	181	0
11/15/2006	7:45	8.311	72.84	0.478	174	0
11/15/2006	8:00	8.528	70.52	0.957	197	0
11/15/2006	8:15	8.744	69.98	0.796	183	0
11/15/2006	8:30	8.933	67.48	1.198	180	0
11/15/2006	8:45	9.061	68.24	1.918	190	0
11/15/2006	9:00	9.683	61.05	1.596	207	0
11/15/2006	9:15	10.244	57.6	1.837	207	0
11/15/2006	9:30	10.494	58.27	1.439	198	0
11/15/2006	9:45	10.433	60.04	1.757	194	0
11/15/2006	10:00	10.433	61.36	0.957	178	0
11/15/2006	10:15	10.278	64.64	0.796	174	0
11/15/2006	10:30	10.089	67.89	1.118	178	0
11/15/2006	10:45	10.217	68.73	1.198	206	0
11/15/2006	11:00	10.561	66.26	1.359	210	0
11/15/2006	11:15	10.433	68.35	1.118	174	0
11/15/2006	11:30	10.244	65.56	0.957	180	0
11/15/2006	11:45	10.406	62.22	0.764	180	0
11/15/2006	12:00	10.656	65.14	1.198	21	0
11/15/2006	12:15	11.028	63.87	0.639	17	0
11/15/2006	12:30	11.339	59.84	0.764	69	0
11/15/2006	12:45	11.494	61.73	0.559	138	0
11/15/2006	13:00	11.744	59.89	1.279	80	0
11/15/2006	13:15	11.967	56.5	1.757	108	0
11/15/2006	13:30	12.278	54.76	1.596	129	0
11/15/2006	13:45	12.217	55.29	1.439	108	0
11/15/2006	14:00	12.122	57.05	1.279	127	0
11/15/2006	14:15	11.994	58.61	0.876	155	0
11/15/2006	14:30	11.744	60.57	0.957	162	0
11/15/2006	14:45	11.561	61.86	1.118	162	0
11/15/2006	15:00	11.494	63.78	1.515	178	0
11/15/2006	15:15	11.561	63.58	1.757	183	0
11/15/2006	15:30	11.717	62.63	1.118	182	0
11/15/2006	15:45	11.656	63.78	0.478	191	0
11/15/2006	16:00	11.872	60.71	0.72	187	0
11/15/2006	16:15	13.872	47.85	2.718	182	0
11/15/2006	16:30	14.278	46.39	2.235	179	0
11/15/2006	16:45	14.089	48.02	2.079	182	0
11/15/2006	17:00	14.433	47.64	2.557	188	0
11/15/2006	17:15	16.494	40.43	5.038	204	0

Date	Time PST	Avg air temp at 1.6 m (°C)	Avg relative humidity (%)	Avg wind speed at 2 m (m/sec)	Avg wind direction at 2 m (degree)	Total precip. (mm)
11/15/2006	17:30	17.811	38.11	4.636	221	0
11/15/2006	17:45	17.933	38.79	3.518	215	0
11/15/2006	18:00	17.933	38.79	3.836	216	0
11/15/2006	18:15	17.872	38.69	3.836	223	0
11/15/2006	18:30	17.778	38.75	2.879	240	0
11/15/2006	18:45	17.683	39.33	3.035	235	0
11/15/2006	19:00	17.433	40.91	3.755	232	0
11/15/2006	19:15	16.622	45.72	2.879	240	0
11/15/2006	19:30	15.778	49.61	2.718	237	0
11/15/2006	19:45	15.744	50.27	3.196	257	0
11/15/2006	20:00	16.433	49.2	4.157	245	0
11/15/2006	20:15	16.933	50.47	4.238	248	0
11/15/2006	20:30	16.811	52.84	4.475	231	0
11/15/2006	20:45	16.244	55.33	4.475	233	0
11/15/2006	21:00	16.311	57.28	4.877	229	0
11/15/2006	21:15	15.872	60.39	4.318	230	0
11/15/2006	21:30	15.433	63.62	3.836	226	0
11/15/2006	21:45	15.244	64.8	3.997	235	0
11/15/2006	22:00	15.622	62.69	4.636	232	0
11/15/2006	22:15	15.994	61.14	4.475	237	0
11/15/2006	22:30	15.683	62.96	4.877	236	0
11/15/2006	22:45	15.528	63.3	3.755	246	0
11/15/2006	23:00	15.622	62.24	3.675	255	0
11/15/2006	23:15	15.933	61.34	3.836	259	0
11/15/2006	23:30	15.778	62.09	3.997	256	0
11/15/2006	23:45	15.744	63.13	4.958	256	0
11/16/2006	0:00	15.244	66.84	4.958	265	0
11/16/2006	0:15	14.311	73.04	4.475	259	0
11/16/2006	0:30	14.244	74	4.636	251	0
11/16/2006	0:45	14.122	75.04	3.836	250	0
11/16/2006	1:00	13.683	74.75	4.555	253	0
11/16/2006	1:15	13.683	65.35	4.716	260	0
11/16/2006	1:30	13.278	62.99	3.357	260	0
11/16/2006	1:45	12.561	62.22	4.636	270	0
11/16/2006	2:00	11.994	63.48	4.475	265	0
11/16/2006	2:15	11.561	64.32	4.475	264	0
11/16/2006	2:30	11.061	65.82	3.675	272	0
11/16/2006	2:45	10.683	68.91	4.157	267	0
11/16/2006	3:00	10.156	70.78	5.275	274	0
11/16/2006	3:15	9.561	72.3	4.475	276	0
11/16/2006	3:30	9.028	74.16	3.357	280	0
11/16/2006	3:45	8.372	75.96	1.439	281	0
11/16/2006	4:00	7.872	75.48	1.279	325	0
11/16/2006	4:15	8.122	73.3	3.035	320	0

Date	Time PST	Avg air temp at 1.6 m (°C)	Avg relative humidity (%)	Avg wind speed at 2 m (m/sec)	Avg wind direction at 2 m (degree)	Total precip. (mm)
11/16/2006	4:30	7.717	73.86	2.557	302	0
11/16/2006	4:45	7.339	72.88	2.235	288	0
11/16/2006	5:00	7.217	71.03	1.439	263	0
11/16/2006	5:15	6.122	74.76	1.439	290	0
11/16/2006	5:30	6.028	75.51	1.118	251	0
11/16/2006	5:45	5.528	76.26	1.118	229	0
11/16/2006	6:00	5.906	73.31	1.676	180	0
11/16/2006	6:15	5.811	73.21	0.796	220	0
11/16/2006	6:30	5.217	77	0.639	168	0
11/16/2006	6:45	5.061	77.6	0.72	183	0
11/16/2006	7:00	4.622	79.88	1.198	257	0
11/16/2006	7:15	4.278	79.86	0.639	268	0
11/16/2006	7:30	3.906	82.04	1.596	269	0
11/16/2006	7:45	5.089	75.79	1.118	260	0
11/16/2006	8:00	5.75	73.19	1.676	274	0
11/16/2006	8:15	6.372	71.02	1.279	264	0
11/16/2006	8:30	7	70.23	1.515	280	0
11/16/2006	8:45	7.622	68.83	1.596	278	0
11/16/2006	9:00	8.372	66.55	0.796	315	0
11/16/2006	9:15	8.994	64.11	0.72	350	0
11/16/2006	9:30	8.872	64.64	1.198	53	0
11/16/2006	9:45	9.528	61.83	0.639	341	0
11/16/2006	10:00	9.994	60.51	0.639	354	0
11/16/2006	10:15	10.061	60.46	0.796	41	0
11/16/2006	10:30	10.311	57.42	1.279	53	0
11/16/2006	10:45	10.494	55.01	0.796	79	0
11/16/2006	11:00	10.839	52.85	0.876	76	0
11/16/2006	11:15	11.061	51.31	0.876	69	0
11/16/2006	11:30	11.372	49.71	1.198	19	0
11/16/2006	11:45	11.561	48.48	0.796	105	0
11/16/2006	12:00	11.683	46.88	0.876	337	0
11/16/2006	12:15	11.994	45	0.639	137	0
11/16/2006	12:30	12.561	40.35	0.639	234	0
11/16/2006	12:45	12.561	40.82	0.957	188	0
11/16/2006	13:00	12.311	41.56	1.198	183	0
11/16/2006	13:15	12.683	41.92	1.439	202	0
11/16/2006	13:30	12.622	42.66	1.279	178	0
11/16/2006	13:45	13.183	42.1	1.118	195	0
11/16/2006	14:00	12.933	42.61	1.359	211	0
11/16/2006	14:15	11.994	47.72	1.837	185	0
11/16/2006	14:30	11.906	48.44	1.359	183	0
11/16/2006	14:45	12.156	47.99	1.359	226	0
11/16/2006	15:00	11.494	50.59	1.439	219	0
11/16/2006	15:15	11.339	51.18	0.957	228	0

Date	Time PST	Avg air temp at 1.6 m (°C)	Avg relative humidity (%)	Avg wind speed at 2 m (m/sec)	Avg wind direction at 2 m (degree)	Total precip. (mm)
11/16/2006	15:30	11.933	51.27	0.796	221	0
11/16/2006	15:45	12.372	49.43	0.957	234	0
11/16/2006	16:00	11.872	51.49	0.957	202	0
11/16/2006	16:15	11.244	54.77	1.279	198	0
11/16/2006	16:30	10.967	56.74	0.957	180	0
11/16/2006	16:45	10.811	57.96	0.639	176	0
11/16/2006	17:00	9.872	64.53	0.876	154	0
11/16/2006	17:15	10.089	62.66	1.118	146	0
11/16/2006	17:30	9.811	61.32	1.198	142	0
11/16/2006	17:45	9.156	62.21	0.796	159	0
11/16/2006	18:00	8.683	65.09	0.796	169	0
11/16/2006	18:15	8.183	66.93	0.845	169	0
11/16/2006	18:30	8.061	67.59	0.559	171	0
11/16/2006	18:45	7.494	69.65	0.796	170	0
11/16/2006	19:00	7.278	70.72	0.796	175	0
11/16/2006	19:15	6.967	73.12	0.796	181	0
11/16/2006	19:30	6.967	75.97	0.639	174	0
11/16/2006	19:45	6.683	77.15	0.796	165	0
11/16/2006	20:00	6.494	76.52	0.764	177	0
11/16/2006	20:15	5.906	78.74	0.156	101	0
11/16/2006	20:30	5.244	82.1	0.639	89	0
11/16/2006	20:45	5.028	81.27	1.118	113	0
11/16/2006	21:00	4.561	81.68	0.478	96	0
11/16/2006	21:15	3.933	84.05	0.764	73	0
11/16/2006	21:30	3.372	87.91	0.764	65	0
11/16/2006	21:45	3.494	86.86	0.764	76	0
11/16/2006	22:00	3.656	85.88	0.845	83	0
11/16/2006	22:15	3.467	85.76	0	85	0
11/16/2006	22:30	3.183	86.8	0	86	0
11/16/2006	22:45	3.372	87.02	0.764	114	0
11/16/2006	23:00	2.872	86.59	0.764	103	0
11/16/2006	23:15	2.061	90.07	0.764	180	0
11/16/2006	23:30	1.589	91.19	0	100	0
11/16/2006	23:45	1.089	92.67	0.076	94	0
11/17/2006	0:00	0.933	93.77	0.764	84	0
11/17/2006	0:15	0.811	93.83	0.156	74	0
11/17/2006	0:30	0.683	94.64	0.156	78	0
11/17/2006	0:45	0.717	95.44	0.478	103	0
11/17/2006	1:00	-0.189	94.69	0.156	29	0
11/17/2006	1:15	0	97.68	0.72	104	0
11/17/2006	1:30	-0.25	96.9	0.72	77	0
11/17/2006	1:45	0	97.27	0.796	90	0
11/17/2006	2:00	-0.628	95.87	0.478	53	0
11/17/2006	2:15	-0.878	98.66	0.639	52	0

Date	Time PST	Avg air temp at 1.6 m (°C)	Avg relative humidity (%)	Avg wind speed at 2 m (m/sec)	Avg wind direction at 2 m (degree)	Total precip. (mm)
11/17/2006	2:30	-1.067	98.64	0.639	82	0
11/17/2006	2:45	-1.128	99.45	0.478	77	0
11/17/2006	3:00	-0.75	99.23	0.684	142	0
11/17/2006	3:15	-0.783	98.45	0.076	139	0
11/17/2006	3:30	-0.75	98.03	0.764	82	0
11/17/2006	3:45	-1.25	98.31	0.639	54	0
11/17/2006	4:00	-1.628	98.86	0.156	75	0
11/17/2006	4:15	-1.628	99.35	0.764	50	0
11/17/2006	4:30	-1.567	99.17	0.478	70	0
11/17/2006	4:45	-1.75	99.04	0.764	57	0
11/17/2006	5:00	-1.878	99.21	0	46	0
11/17/2006	5:15	-1.75	99.4	0	11	0
11/17/2006	5:30	-1.5	99.45	0.764	23	0
11/17/2006	5:45	-0.878	99.35	0.478	43	0
11/17/2006	6:00	-0.628	98.53	0.478	54	0
11/17/2006	6:15	-0.567	99.38	0.764	38	0
11/17/2006	6:30	-0.439	99.62	0.684	50	0
11/17/2006	6:45	-0.317	99.64	0.845	67	0
11/17/2006	7:00	-0.161	99.72	0.076	59	0
11/17/2006	7:15	0	99.69	0	59	0
11/17/2006	7:30	0.25	99.8	0.076	78	0
11/17/2006	7:45	0.75	99.39	0.156	195	0
11/17/2006	8:00	1.372	98.08	0	204	0
11/17/2006	8:15	1.656	97.08	0.156	194	0
11/17/2006	8:30	1.811	96.12	0.156	0	0
11/17/2006	8:45	1.906	97.09	0.156	331	0
11/17/2006	9:00	2.5	95.22	0.796	323	0
11/17/2006	9:15	3.028	93.76	0.639	346	0
11/17/2006	9:30	3.183	94.5	0.957	48	0
11/17/2006	9:45	3.561	94.14	0.478	11	0
11/17/2006	10:00	4.028	89.92	0.639	346	0
11/17/2006	10:15	4.528	86.83	0.796	348	0
11/17/2006	10:30	5.089	84.03	0.796	13	0
11/17/2006	10:45	5.156	83.14	0.72	31	0
11/17/2006	11:00	5.061	84.54	0.559	5	0
11/17/2006	11:15	5.278	83.91	0.156	335	0
11/17/2006	11:30	5.589	83.32	0.639	64	0
11/17/2006	11:45	6.028	81.6	0.559	353	0
11/17/2006	12:00	6.372	79.6	0.764	339	0
11/17/2006	12:15	6.933	77.65	0.764	327	0
11/17/2006	12:30	7.683	72.57	0.957	18	0
11/17/2006	12:45	7.778	69.71	1.118	346	0
11/17/2006	13:00	7.561	67.89	1.279	339	0
11/17/2006	13:15	7.244	70.18	1.439	20	0

Date	Time PST	Avg air temp at 1.6 m (°C)	Avg relative humidity (%)	Avg wind speed at 2 m (m/sec)	Avg wind direction at 2 m (degree)	Total precip. (mm)
11/17/2006	13:30	7.494	69.11	1.279	32	0
11/17/2006	13:45	7.622	68.96	1.279	359	0
11/17/2006	14:00	7.744	68.94	1.279	4	0
11/17/2006	14:15	7.683	69.3	0.957	351	0
11/17/2006	14:30	8.089	68.26	0.478	356	0
11/17/2006	14:45	8.433	66	0.156	22	0
11/17/2006	15:00	7.717	68.55	0	20	0
11/17/2006	15:15	7.372	70.1	0.684	332	0
11/17/2006	15:30	7.156	72.26	0.764	255	0
11/17/2006	15:45	6.656	75.3	0	24	0
11/17/2006	16:00	6.744	74.5	0	6	0
11/17/2006	16:15	6.778	74.07	0	327	0
11/17/2006	16:30	6.339	76.17	0.076	176	0
11/17/2006	16:45	5.994	77.04	0	171	0
11/17/2006	17:00	5.156	79.86	0	171	0
11/17/2006	17:15	4.372	82.75	0	171	0
11/17/2006	17:30	3.75	86.71	0	171	0
11/17/2006	17:45	3.75	85.41	0.076	165	0
11/17/2006	18:00	2.5	87.69	0.076	12	0
11/17/2006	18:15	1.467	93.37	0	357	0
11/17/2006	18:30	1.25	94.68	0	0	0
11/17/2006	18:45	0.933	94.52	0.796	104	0
11/17/2006	19:00	0.75	96.59	0.639	66	0
11/17/2006	19:15	0.183	97.39	0.156	75	0
11/17/2006	19:30	0.061	98.16	0.478	30	0
11/17/2006	19:45	-0.094	98.99	0.684	312	0
11/17/2006	20:00	0.25	98.6	0	320	0
11/17/2006	20:15	0.656	98.14	0.559	64	0
11/17/2006	20:30	0.217	96.18	0.72	107	0
11/17/2006	20:45	0.061	97.49	0.764	132	0
11/17/2006	21:00	0.122	96.62	0	165	0
11/17/2006	21:15	0.406	96.48	0	154	0
11/17/2006	21:30	-0.472	95.56	0.156	64	0
11/17/2006	21:45	-0.817	97.88	0.764	180	0
11/17/2006	22:00	-0.317	97.71	0.156	55	0
11/17/2006	22:15	-1.378	97.32	0.764	54	0
11/17/2006	22:30	-1.689	98.43	0	59	0
11/17/2006	22:45	-1.939	99.21	0.764	29	0
11/17/2006	23:00	-2.439	98.79	0.796	58	0
11/17/2006	23:15	-2.094	99.73	0.957	63	0
11/17/2006	23:30	-2.439	99.74	0.72	50	0
11/17/2006	23:45	-2.378	99.84	0	32	0
11/18/2006	0:00	-2.317	99.85	0.684	71	0
11/18/2006	0:15	-2.472	99.76	0	82	0

Date	Time PST	Avg air temp at 1.6 m (°C)	Avg relative humidity (%)	Avg wind speed at 2 m (m/sec)	Avg wind direction at 2 m (degree)	Total precip. (mm)
11/18/2006	0:30	-2.222	99.9	0.156	82	0
11/18/2006	0:45	-2.189	99.88	0.478	90	0
11/18/2006	1:00	-2.25	99.51	0.845	81	0
11/18/2006	1:15	-2.722	99.51	0.478	74	0
11/18/2006	1:30	-2.75	99.71	0.845	82	0
11/18/2006	1:45	-2.878	99.69	0.559	89	0
11/18/2006	2:00	-3.283	99.56	0.478	64	0
11/18/2006	2:15	-3.689	99.47	0.796	70	0
11/18/2006	2:30	-3.628	99.54	0.559	56	0
11/18/2006	2:45	-3.722	99.52	0	47	0
11/18/2006	3:00	-3.5	99.58	0	47	0
11/18/2006	3:15	-3.317	99.63	0	94	0
11/18/2006	3:30	-2.75	99.77	0.156	117	0
11/18/2006	3:45	-2.939	99.71	0	109	0
11/18/2006	4:00	-3.378	99.61	0.684	51	0
11/18/2006	4:15	-3.817	99.5	0.156	46	0
11/18/2006	4:30	-3.378	99.6	0.764	32	0
11/18/2006	4:45	-3.067	99.69	0.72	43	0
11/18/2006	5:00	-3.378	99.61	0.639	50	0
11/18/2006	5:15	-3.878	99.48	0.764	84	0
11/18/2006	5:30	-3.844	99.49	0	88	0
11/18/2006	5:45	-3.628	99.54	0	88	0
11/18/2006	6:00	-3.5	99.58	0	88	0
11/18/2006	6:15	-3.094	99.68	0	88	0
11/18/2006	6:30	-2.689	99.79	0	88	0
11/18/2006	6:45	-2.378	99.86	0	88	0
11/18/2006	7:00	-2.094	99.93	0.156	88	0
11/18/2006	7:15	-2	99.96	0.764	350	0
11/18/2006	7:30	-2.128	99.92	0.156	349	0
11/18/2006	7:45	-2.067	99.93	0.559	13	0
11/18/2006	8:00	-1.972	99.96	0.639	29	0
11/18/2006	8:15	-1.911	99.98	0.559	32	0
11/18/2006	8:30	-1.817	100	0.478	18	0
11/18/2006	8:45	-1.567	100	0.478	28	0
11/18/2006	9:00	-1.317	100	0.156	54	0
11/18/2006	9:15	-1.128	100	0.076	68	0
11/18/2006	9:30	-1	100	0.684	340	0
11/18/2006	9:45	-0.878	100	0.478	320	0
11/18/2006	10:00	-0.317	100	0.639	303	0
11/18/2006	10:15	0.061	100	0.957	287	0
11/18/2006	10:30	0	100	1.118	300	0
11/18/2006	10:45	0.122	100	1.118	309	0
11/18/2006	11:00	0.433	100	1.596	322	0
11/18/2006	11:15	0.589	100	1.359	315	0

Date	Time PST	Avg air temp at 1.6 m (°C)	Avg relative humidity (%)	Avg wind speed at 2 m (m/sec)	Avg wind direction at 2 m (degree)	Total precip. (mm)
11/18/2006	11:30	1.061	100	0.639	338	0
11/18/2006	11:45	1.561	100	0.684	300	0
11/18/2006	12:00	2.244	100	0.639	252	0
11/18/2006	12:15	2.967	100	1.118	257	0
11/18/2006	12:30	3.994	93.59	1.279	244	0
11/18/2006	12:45	5.061	88.71	1.359	236	0
11/18/2006	13:00	6.278	84.7	1.118	289	0
11/18/2006	13:15	7.061	81.1	2.396	310	0
11/18/2006	13:30	7.433	79.4	2.316	318	0
11/18/2006	13:45	7.528	79.38	2.316	325	0
11/18/2006	14:00	7.839	76.26	2.316	342	0
11/18/2006	14:15	7.906	74.23	2.718	2	0
11/18/2006	14:30	7.683	75.6	2.079	349	0
11/18/2006	14:45	7.494	76.64	2.079	348	0
11/18/2006	15:00	7.339	77.12	1.918	344	0
11/18/2006	15:15	7.122	78.99	2.079	339	0
11/18/2006	15:30	7	79.38	1.757	345	0
11/18/2006	15:45	6.744	80.25	1.279	329	0
11/18/2006	16:00	6.244	81.86	0.957	317	0
11/18/2006	16:15	5.717	83.67	0.957	315	0
11/18/2006	16:30	5.467	83.73	1.198	313	0
11/18/2006	16:45	5.778	81.65	1.515	324	0
11/18/2006	17:00	5.839	80.51	1.757	332	0
11/18/2006	17:15	5.589	80.73	2.079	334	0
11/18/2006	17:30	5.311	81.69	1.998	330	0
11/18/2006	17:45	5.061	82.44	1.757	319	0
11/18/2006	18:00	4.967	82.78	1.118	329	0
11/18/2006	18:15	4.906	81.94	0.639	346	0
11/18/2006	18:30	4.778	82.1	0.478	324	0
11/18/2006	18:45	4.717	82.19	0.796	347	0
11/18/2006	19:00	4.217	84.41	0.764	335	0
11/18/2006	19:15	4.089	85.59	0.156	335	0
11/18/2006	19:30	3.967	86.58	0.156	327	0
11/18/2006	19:45	3.811	87.62	0.156	318	0
11/18/2006	20:00	3.75	88.4	0.156	309	0
11/18/2006	20:15	3.494	88.96	0.156	309	0
11/18/2006	20:30	3.622	88.04	0.764	290	0
11/18/2006	20:45	2.622	89.52	0.478	318	0
11/18/2006	21:00	1.311	95.58	0.639	316	0
11/18/2006	21:15	1.683	96.85	0.764	268	0
11/18/2006	21:30	2.339	94.42	0.076	257	0
11/18/2006	21:45	2.744	91.58	0	188	0
11/18/2006	22:00	2.839	91.53	0.764	174	0
11/18/2006	22:15	2.967	90.82	0.639	164	0

Date	Time PST	Avg air temp at 1.6 m (°C)	Avg relative humidity (%)	Avg wind speed at 2 m (m/sec)	Avg wind direction at 2 m (degree)	Total precip. (mm)
11/18/2006	22:30	2.744	91.23	0.559	160	0
11/18/2006	22:45	2.622	92.18	0.72	137	0
11/18/2006	23:00	2.372	92.82	0.478	145	0
11/18/2006	23:15	2.372	93.76	0.764	168	0
11/18/2006	23:30	2.433	93.72	0.156	170	0
11/18/2006	23:45	2.339	94.29	0.72	163	0
11/19/2006	0:00	2.433	93.97	0.639	165	0
11/19/2006	0:15	2.433	95.4	1.279	158	0
11/19/2006	0:30	2.122	98.69	1.118	162	0
11/19/2006	0:45	2	99.14	0.559	151	0
11/19/2006	1:00	1.811	99.31	0.684	122	0
11/19/2006	1:15	1.494	99.62	0.764	217	0
11/19/2006	1:30	0.933	99.97	0.559	32	0
11/19/2006	1:45	0.406	100	0.478	36	0
11/19/2006	2:00	0.339	100	0.478	76	0
11/19/2006	2:15	0.622	100	0.72	61	0
11/19/2006	2:30	0.561	100	0.72	13	0
11/19/2006	2:45	0.656	100	0.639	43	0
11/19/2006	3:00	0.683	100	0.639	87	0
11/19/2006	3:15	0.75	100	0.639	111	0
11/19/2006	3:30	0.967	100	0.478	130	0
11/19/2006	3:45	0.75	100	0.478	107	0
11/19/2006	4:00	0.589	100	0.764	25	0
11/19/2006	4:15	0.25	100	0	311	0
11/19/2006	4:30	0.25	100	0	322	0
11/19/2006	4:45	0.183	100	0.156	77	0
11/19/2006	5:00	0	100	0	91	0
11/19/2006	5:15	0.089	100	0.845	84	0
11/19/2006	5:30	0.122	100	0.764	23	0
11/19/2006	5:45	0.061	100	0.156	27	0
11/19/2006	6:00	0.122	100	0.478	100	0
11/19/2006	6:15	0.25	100	0.076	157	0
11/19/2006	6:30	0.183	100	0.156	3	0
11/19/2006	6:45	0.183	100	0.156	87	0
11/19/2006	7:00	0.278	100	0.684	180	0
11/19/2006	7:15	0.683	100	0.684	132	0
11/19/2006	7:30	0.933	100	0.764	119	0
11/19/2006	7:45	1.122	100	0.156	120	0
11/19/2006	8:00	1.183	100	0.764	111	0
11/19/2006	8:15	1.494	100	0.478	113	0
11/19/2006	8:30	1.811	100	0.478	118	0
11/19/2006	8:45	1.933	100	0.559	124	0
11/19/2006	9:00	2.183	100	0.764	155	0
11/19/2006	9:15	2.561	100	0.156	160	0

Date	Time PST	Avg air temp at 1.6 m (°C)	Avg relative humidity (%)	Avg wind speed at 2 m (m/sec)	Avg wind direction at 2 m (degree)	Total precip. (mm)
11/19/2006	9:30	2.933	100	0.478	149	0
11/19/2006	9:45	3.339	100	0.478	155	0
11/19/2006	10:00	3.75	100	0.478	156	0
11/19/2006	10:15	4.183	97.66	0.559	155	0
11/19/2006	10:30	4.717	96.04	0.845	179	0
11/19/2006	10:45	5.028	94.79	0.845	205	0
11/19/2006	11:00	5.244	93.82	0.764	203	0
11/19/2006	11:15	5.406	95.85	0.957	157	0
11/19/2006	11:30	5.217	97.93	1.359	158	0.254
11/19/2006	11:45	5.089	98.67	0.957	151	0
11/19/2006	12:00	5.061	98.59	1.118	146	0
11/19/2006	12:15	5.156	97.93	0.684	150	0
11/19/2006	12:30	5.244	97.97	0.764	86	0
11/19/2006	12:45	5.244	98.52	0.559	109	0
11/19/2006	13:00	5.339	98.72	1.198	125	0
11/19/2006	13:15	5.717	96.99	0.876	153	0
11/19/2006	13:30	6.217	90.62	1.596	180	0
11/19/2006	13:45	6.244	86.89	2.079	183	0
11/19/2006	14:00	6.372	86.76	1.596	162	0
11/19/2006	14:15	6.278	88.45	1.676	142	0
11/19/2006	14:30	6.339	90.36	0.639	47	0
11/19/2006	14:45	6.339	89.1	0.72	83	0
11/19/2006	15:00	6.278	88.83	1.037	102	0
11/19/2006	15:15	6.122	89.35	1.118	109	0
11/19/2006	15:30	6.028	90.27	0.559	77	0
11/19/2006	15:45	5.967	91.16	0.478	94	0
11/19/2006	16:00	5.994	91.62	0.764	103	0
11/19/2006	16:15	5.994	92.97	0.639	21	0
11/19/2006	16:30	5.906	93.77	0.796	90	0
11/19/2006	16:45	5.778	94.36	1.198	146	0
11/19/2006	17:00	5.656	95.4	1.037	157	0
11/19/2006	17:15	5.561	96.61	1.596	141	0
11/19/2006	17:30	5.561	97.1	1.439	151	0
11/19/2006	17:45	5.622	95.76	1.118	169	0
11/19/2006	18:00	5.75	94.59	1.279	152	0
11/19/2006	18:15	5.872	94.06	0.957	155	0
11/19/2006	18:30	5.933	93.73	0.957	154	0
11/19/2006	18:45	5.967	93.56	0.478	122	0
11/19/2006	19:00	5.967	93.54	0.72	168	0
11/19/2006	19:15	5.994	93.74	0.764	226	0
11/19/2006	19:30	6.028	94.39	0.764	131	0
11/19/2006	19:45	5.933	95.72	0.796	93	0
11/19/2006	20:00	5.872	96.16	0.478	99	0
11/19/2006	20:15	5.967	95.77	0.639	104	0

Date	Time PST	Avg air temp at 1.6 m (°C)	Avg relative humidity (%)	Avg wind speed at 2 m (m/sec)	Avg wind direction at 2 m (degree)	Total precip. (mm)
11/19/2006	20:30	5.933	95.58	0.796	70	0
11/19/2006	20:45	5.839	97.17	0.684	337	0
11/19/2006	21:00	5.778	97.86	0	337	0
11/19/2006	21:15	5.75	98.28	0.156	335	0
11/19/2006	21:30	5.656	98.76	0.076	316	0
11/19/2006	21:45	5.406	98.95	0	337	0
11/19/2006	22:00	5.156	99.44	0	335	0
11/19/2006	22:15	4.839	99.75	0	334	0
11/19/2006	22:30	4.683	100	0.156	342	0
11/19/2006	22:45	4.561	100	0.478	328	0
11/19/2006	23:00	4.744	100	1.118	312	0
11/19/2006	23:15	4.717	100	0.796	303	0
11/19/2006	23:30	4.622	100	0.764	316	0
11/19/2006	23:45	4.372	100	0.764	322	0
11/20/2006	0:00	4.311	100	0.639	325	0
11/20/2006	0:15	4.339	100	0.076	256	0
11/20/2006	0:30	4.278	100	0.156	1	0
11/20/2006	0:45	4.244	100	0.076	44	0
11/20/2006	1:00	4.339	100	0.764	113	0
11/20/2006	1:15	4.372	100	0.076	120	0
11/20/2006	1:30	4.528	100	0.639	132	0
11/20/2006	1:45	4.5	100	0.639	151	0
11/20/2006	2:00	4.467	100	0.639	153	0
11/20/2006	2:15	4.467	100	0.957	132	0
11/20/2006	2:30	4.622	100	0.639	146	0
11/20/2006	2:45	4.778	100	0.684	163	0
11/20/2006	3:00	4.906	100	0	156	0
11/20/2006	3:15	5.061	100	0.076	160	0
11/20/2006	3:30	5.156	100	0	160	0
11/20/2006	3:45	5.156	100	0.639	80	0.254
11/20/2006	4:00	5.244	100	0.796	127	0
11/20/2006	4:15	5.406	100	0.559	93	0
11/20/2006	4:30	6.156	100	0.845	171	0
11/20/2006	4:45	6.589	100	0.156	131	0
11/20/2006	5:00	6.494	100	0.684	142	0
11/20/2006	5:15	6.406	100	0.764	162	0
11/20/2006	5:30	7.156	99.05	1.118	242	0
11/20/2006	5:45	7.717	95.3	1.359	228	0
11/20/2006	6:00	7.561	95.6	1.118	214	0
11/20/2006	6:15	7.406	96.8	1.757	200	0
11/20/2006	6:30	7.561	97.34	1.118	210	0
11/20/2006	6:45	7.467	97.29	0.796	255	0
11/20/2006	7:00	7.528	96.88	1.439	217	0
11/20/2006	7:15	7.656	95.58	0.957	204	0

Date	Time PST	Avg air temp at 1.6 m (°C)	Avg relative humidity (%)	Avg wind speed at 2 m (m/sec)	Avg wind direction at 2 m (degree)	Total precip. (mm)
11/20/2006	7:30	7.717	94.17	0.876	205	0
11/20/2006	7:45	7.872	92.61	0.876	228	0
11/20/2006	8:00	7.656	92.3	1.037	142	0
11/20/2006	8:15	7.061	96.26	1.596	180	0
11/20/2006	8:30	8.778	89.74	1.439	161	0
11/20/2006	8:45	9.278	87.21	1.359	180	0
11/20/2006	9:00	9.683	86.16	1.279	178	0
11/20/2006	9:15	10.244	83.81	1.279	191	0
11/20/2006	9:30	11.244	76.85	2.638	230	0
11/20/2006	9:45	11.528	75.93	2.557	228	0
11/20/2006	10:00	11.744	75.49	3.196	226	0
11/20/2006	10:15	12.656	71.75	2.879	233	0
11/20/2006	10:30	13.028	69.21	2.396	227	0
11/20/2006	10:45	12.933	67.96	2.235	232	0
11/20/2006	11:00	12.994	66.42	2.557	245	0
11/20/2006	11:15	12.933	66.21	2.235	243	0
11/20/2006	11:30	13.311	65.49	2.718	246	0
11/20/2006	11:45	13.683	63.05	3.035	237	0
11/20/2006	12:00	13.994	61.66	2.955	230	0
11/20/2006	12:15	14.183	59.05	2.638	243	0
11/20/2006	12:30	14.433	55.94	2.798	253	0
11/20/2006	12:45	14.872	55.04	2.079	251	0
11/20/2006	13:00	14.994	52.61	2.718	250	0
11/20/2006	13:15	15.089	52.01	2.477	180	0
11/20/2006	13:30	15.061	51.03	2.879	258	0
11/20/2006	13:45	15.122	50.35	2.396	269	0
11/20/2006	14:00	15.372	50.15	1.596	266	0
11/20/2006	14:15	15.244	50.12	1.757	251	0
11/20/2006	14:30	15.156	51.03	1.757	180	0
11/20/2006	14:45	14.933	52.22	1.918	227	0
11/20/2006	15:00	14.622	52.41	2.235	235	0
11/20/2006	15:15	13.933	55.31	1.998	223	0
11/20/2006	15:30	13.967	55.7	2.079	210	0
11/20/2006	15:45	13.433	58.74	1.998	204	0
11/20/2006	16:00	12.872	61.47	1.037	174	0
11/20/2006	16:15	12.122	63.59	0.796	162	0
11/20/2006	16:30	11.183	67.02	0.957	149	0
11/20/2006	16:45	10.744	68.01	0.72	160	0
11/20/2006	17:00	10.433	67.56	0.796	155	0
11/20/2006	17:15	10.561	66.48	1.515	188	0
11/20/2006	17:30	10.683	65.68	1.998	206	0
11/20/2006	17:45	10.244	67.05	1.279	186	0
11/20/2006	18:00	8.656	73.35	1.118	103	0
11/20/2006	18:15	7.278	81.4	1.439	115	0

Date	Time PST	Avg air temp at 1.6 m (°C)	Avg relative humidity (%)	Avg wind speed at 2 m (m/sec)	Avg wind direction at 2 m (degree)	Total precip. (mm)
11/20/2006	18:30	7.656	79.01	0.796	116	0
11/20/2006	18:45	8.183	78.12	0.559	137	0
11/20/2006	19:00	6.967	82.08	0.156	149	0
11/20/2006	19:15	6.872	81.68	0	168	0
11/20/2006	19:30	5.156	87.12	0.764	158	0
11/20/2006	19:45	4.244	93.06	0.684	272	0
11/20/2006	20:00	3.25	93.39	0.957	323	0
11/20/2006	20:15	2.906	96.56	0.957	324	0
11/20/2006	20:30	2.744	96.91	0.796	325	0
11/20/2006	20:45	2.811	97.62	0.156	325	0
11/20/2006	21:00	2.872	97.79	0	325	0
11/20/2006	21:15	2.683	96.89	0.845	327	0
11/20/2006	21:30	2.872	98.17	0.559	328	0
11/20/2006	21:45	3.372	96.89	0	326	0
11/20/2006	22:00	3.561	95.51	0.156	330	0
11/20/2006	22:15	2.406	94.35	0.559	338	0
11/20/2006	22:30	1.933	99.31	1.118	115	0
11/20/2006	22:45	2.683	98.09	0.076	134	0
11/20/2006	23:00	2.406	99.07	0.684	143	0
11/20/2006	23:15	2.122	98.95	0.559	83	0
11/20/2006	23:30	1.183	99	0.478	75	0
11/20/2006	23:45	1.089	100	0.764	81	0

APPENDIX C: WORKING METHOD

Food and Environmental Quality Laboratory
Washington State University

FEQL Project Number: FEQL-NG-0605

ANALYTICAL METHOD: DETERMINATION OF RESIDUES OF MITC TRAPPED IN CHARCOAL: ROUTINE SAMPLE HANDLING AND ANALYSIS BY GAS CHROMATOGRAPHY USING NITROGEN PHOSPHORUS DETECTION

Sample Handling and Storage Integrity

1. The MITC field charcoal-filled glass tubes samples (226-16 [200/800 mg], SKC West, Fullerton, CA) will be received under cold storage (dry ice) in insulated chests.
2. As soon as the samples are received, the samples will be logged in according to FEQL NG-0605 FIELD DATA BOOK procedures. The charcoal cartridges will be removed from the insulated chests, and immediately stored in a -80°C freezer (Forma Scientific), located in the FEQL Lab.
3. Before sample analyses begin, three sets of three clean, unused charcoal tubes each will be similarly spiked with 50 µL of a 100 µg/mL MITC solution (Solution # 13163-1), and stored in the -80°C freezer along with the field samples to account for storage stability. These freezer spikes will be analyzed at the beginning and after the last field samples had been processed.

Routine Analysis

1. Sets of four to ten charcoal tube samples will be removed from the -80°C freezer and allowed to warm to room temperature.
2. For each analytical set, fortified recovery samples will be prepared by adding the MITC solution. Fortification levels will range from the methods limit of quantitation LOQ (ca. 0.5 µg m⁻³) to concentrations that exceed the highest residues encountered. To determine trapping efficiency of the charcoal tubes during actual sample analyzes, fortifications using 50 µL of a 100 µg/mL MITC solution (Solution # 13163-1) will be applied into the intakes of charcoal tubes at normal air operating conditions during residential sampling. These samples can also serve as trip fortified recovery samples. Trip cartridge blanks will also routinely accompany the samples and also serve as controls.
3. The plastic caps will be removed from the charcoal tubes and the complete contents of each tube (glass wool, plug, and charcoal) will be emptied into appropriately labeled 25 mL screw-cap Corex® vials.
4. Five mL of an 80/20 solution mixture composed of ethyl acetate (HPLC grade, Fisher Scientific); carbon disulfide (99+%, EM) will be added to each vial by volumetric pipet, and then sealed (the solvent-charcoal interaction is exothermic) and sonicated for ca. one minute in a water-filled sonic bath (VWR AquaSonic®). The 80/20 solvent mixture will be stored in

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a 4-liter, screw-cap amber glass bottle in the dark when not in use to avoid decomposition of carbon disulfide.

5. After sonication, the samples will be chilled before transferring, by disposable glass Pasteur pipette (Fisher Scientific), a pipette-full aliquot (~ 1-2 mL) to a 10 mL glass Luer-Lok® syringe fitted with a 0.45 µm Teflon® membrane filter (Whatman®). Enough sample will be filtered into an appropriately labeled autosampler vial to approximately half fill the vial.
6. The spent 0.45 µm filter will be discarded and the syringe rinsed with clean acetone solvent (Baker®) in preparation for the next sample extraction/filtration.
7. The determination of MITC will be performed by gas chromatography with nitrogen-phosphorus thermionic detection (TSD). Conditions for determination are as follows:

Instrument: A Varian Star 3400CX gas chromatograph using Nitrogen Phosphorus Detection (NPD) with 8200CX Autosampler will be used for residue detection and quantification. Integration of chromatographic data will be performed using Varian Star Chromatography Workstation software.

Column: Agilent 1701, 15m x 0.56mm, 1 µm film thickness

Carrier gas: Ultrapure helium, column flow rate ca 4 to 6 ml/min.

Temperatures: Detector: 260°C

Injector port: 55 to 225°C (rate: 250°C per min), hold for 2 min.

Oven program

Initial: 55°C, hold for 0.09min.

Ramp A: 5°C/min to 80°C

MITC Retention time: 3.8 – 4.2 min

Injection volume: 1 µl

The hydrogen, air, and make-up gas flows will be set at 3-4 mL/min, 100-120 mL/min, and 25-30 mL/min, respectively. The TSD bead current will be from 3 to 3.25 A.

8. Prior to the determination of MITC in the charcoal extracts, a 4 point, two-orders-of-magnitude (0.1 ng to 5 ng on column) standard curve will be generated using MITC calibration standards dissolved in the 80/20 ethyl acetate/carbon disulfide solvent mixture. The dilute standards and fortification solutions will be prepared from a 99%

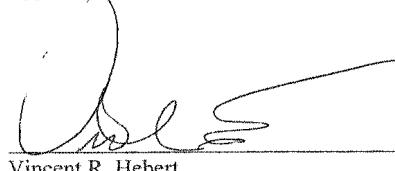
Food and Environmental Quality Laboratory
Washington State University

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pure analytical standard of MITC (ChemService, West Chester, PA). A new standard curve will be generated for each analytical set. For each analytical set, all field samples will be bracketed with MITC standards for external calibration.

9. All sample extracts will be archived at -20°C after GC determination until the end of the study. If concentration levels warrant confirmation, MITC residues will be confirmed by GC/MS in SIM mode using up to 3 characteristic positive mass ions for MITC.

Approval:



Vincent R. Hebert
Laboratory Research Director

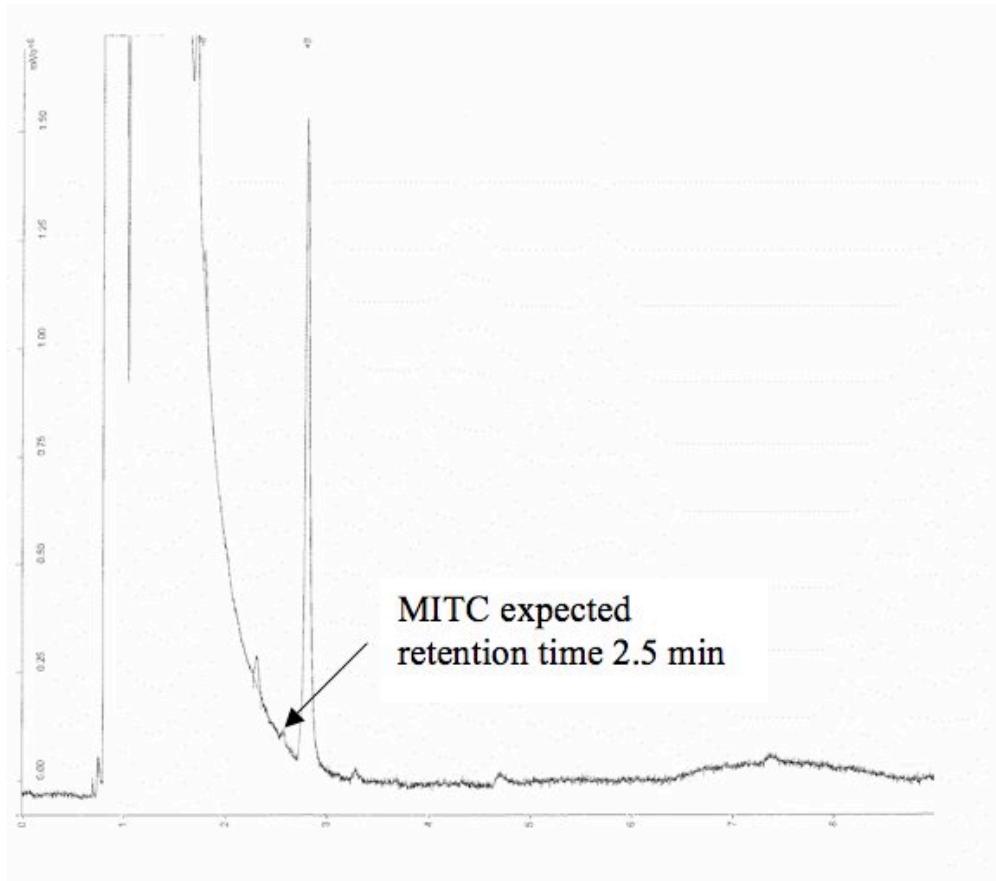
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APPENDIX D: CHROMATOGRAMS

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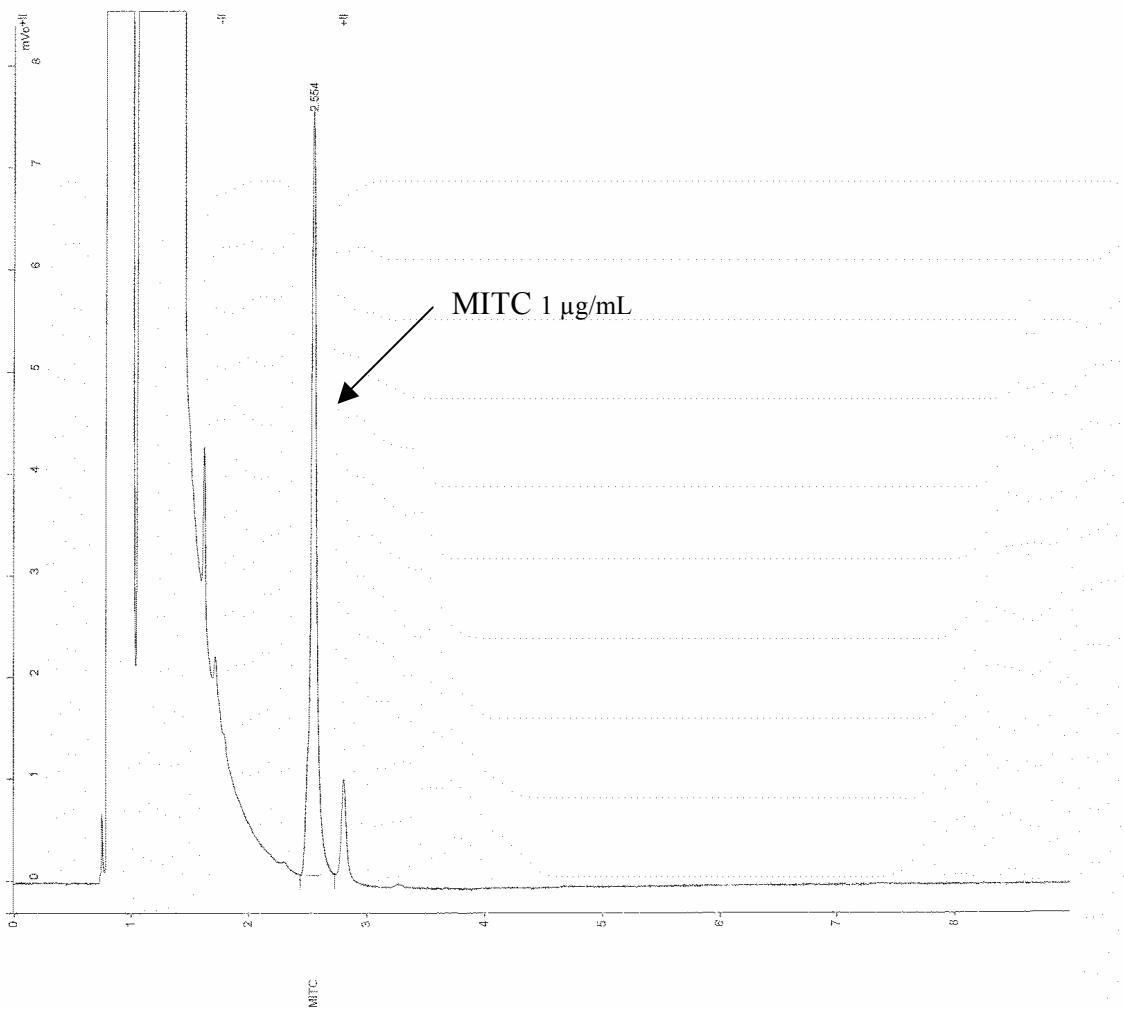
Figure 4
Control sample, 1106-C18



Peak No.	Peak Name	Result ()	Ret. Time (min)	Time Offset (min)	Area (counts)	Sep. Code	Width 1/2 (sec)	Status Codes
Totals:		0.0000		0.000	0			

Total Unidentified Counts : 0 counts

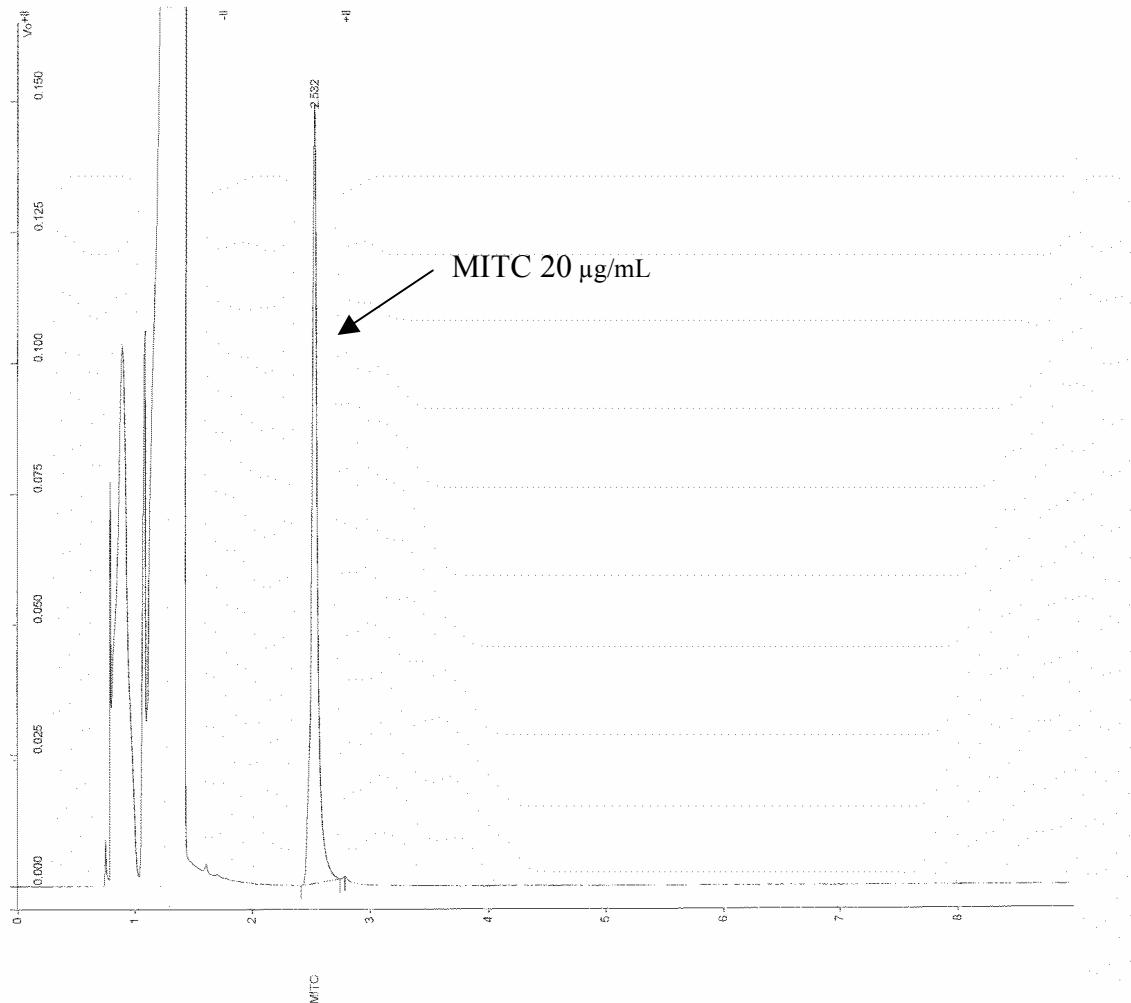
Figure 5
MITC Standard 131645, 1 ug/mL



Peak No.	Peak Name	Result ()	Ret. Time (min)	Time Offset (min)	Area (counts)	Sep. Code	Width 1/2 (sec)	Status Codes
1	MITC	100.0000	2.554	0.094	26109	BB	2.7	
Totals:		100.0000		0.094	26109			

Total Unidentified Counts : 0 counts

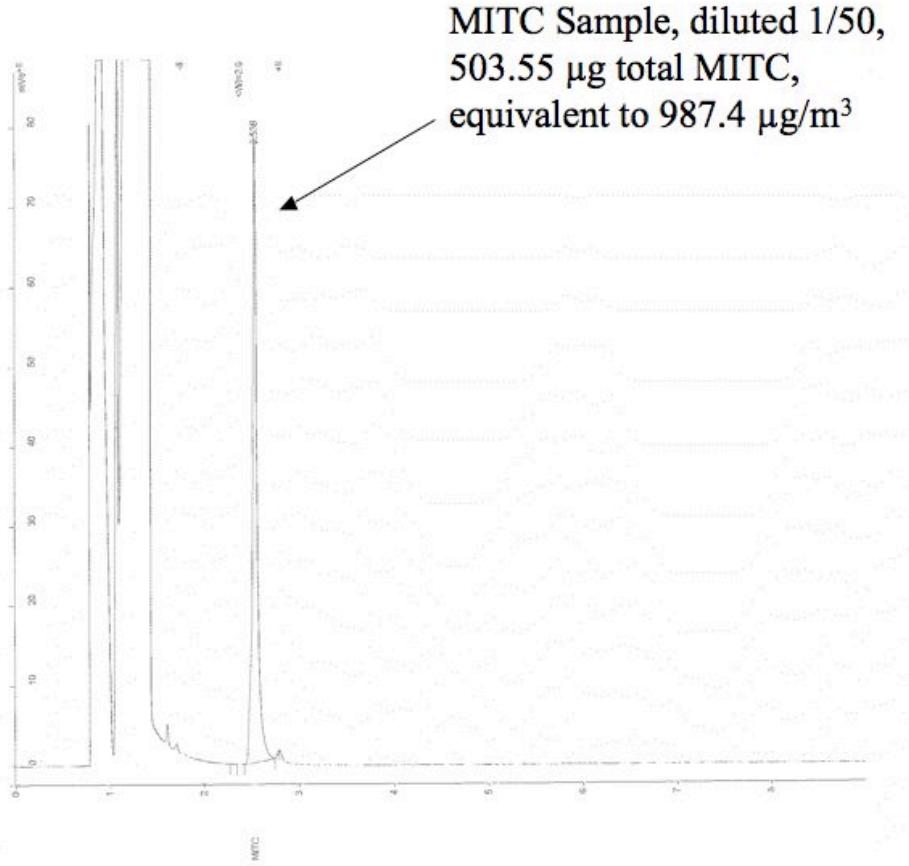
Figure 6
MITC Standard 131642, 20 ug/mL



Peak No.	Peak Name	Result ()	Ret. Time (min)	Time Offset (min)	Area (counts)	Sep. Code	Width 1/2 (sec)	Status Codes
1	MITC	100.0000	2.532	0.072	508420	BP	2.6	
	Totals:	100.0000		0.072	508420			

Total Unidentified Counts : 0 counts

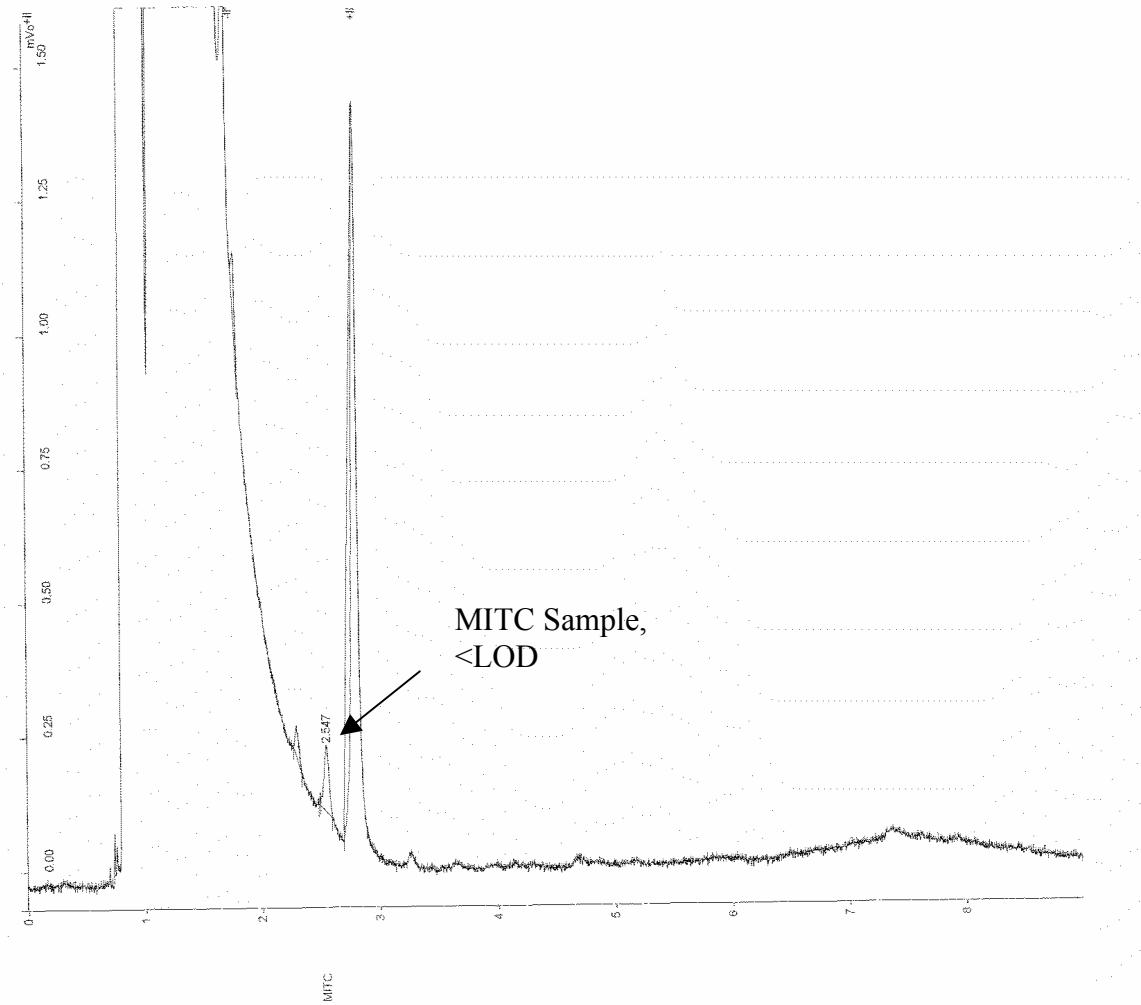
Figure 7
Maximum MITC detected, Sample F1-B-4L
Dilution 1/50



Peak No.	Peak Name	Result ()	Ret. Time (min)	Time Offset (min)	Area (counts)	Sep. Code	1/2 (sec)	Status Codes
1	MITC	100.0000	2.536	0.076	262126	BP	2.6	
	Totals:	100.0000		0.076	262126			

Total Unidentified Counts : 0 counts

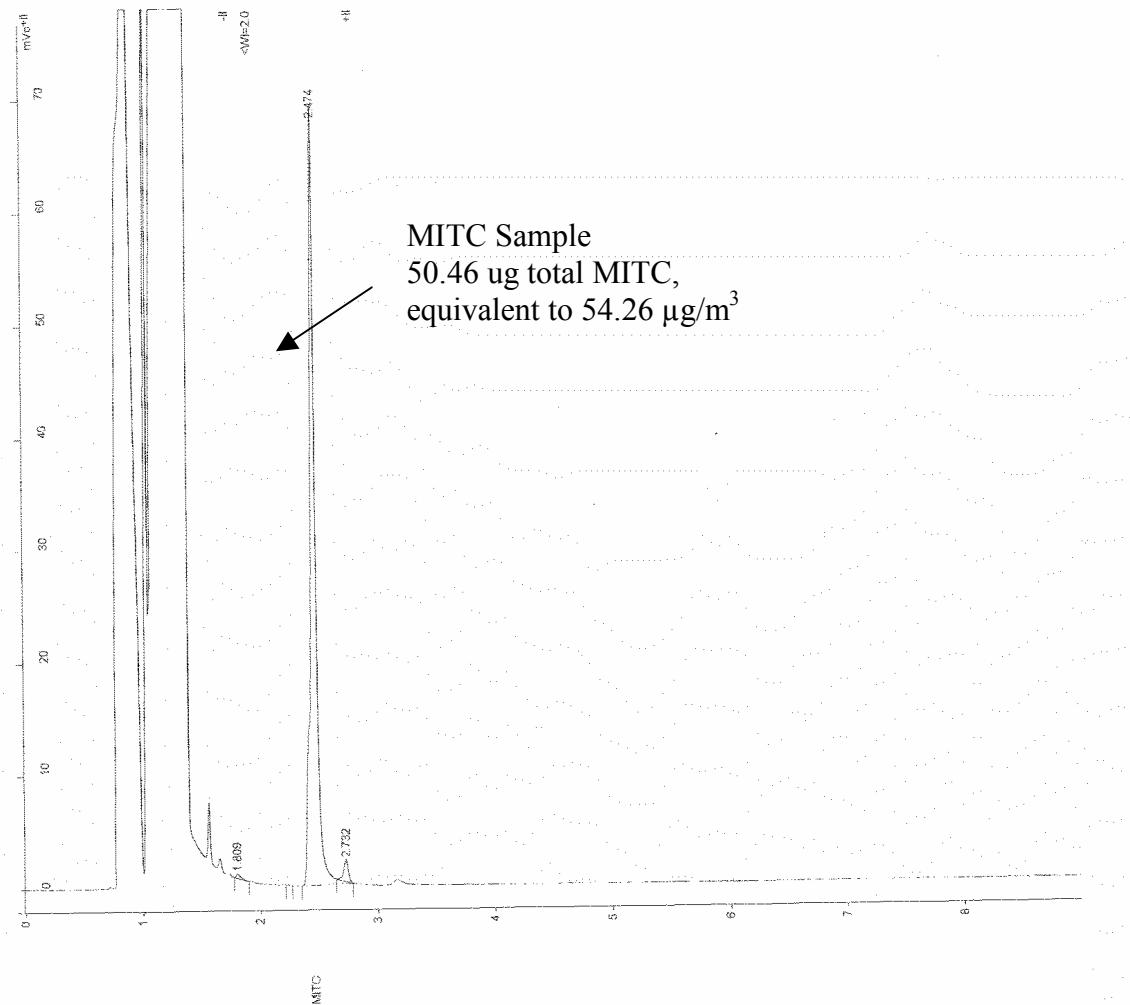
Figure 8
Low-Level MITC, (<LOD)
Sample F2-B-12L



Peak No.	Peak Name	Result ()	Ret. Time (min)	Time Offset (min)	Area (counts)	Sep. Code	1/2 sec (sec)	Status Codes
1	MITC	100.0000	2.547	0.087	349	VB	2.5	
	Totals:	100.0000		0.087	349			

Total Unidentified Counts : 0 counts

Figure 9
Mid-range MITC detection, Sample F1-D-7R



Peak No.	Peak Name	Result ()	Ret. Time (min)	Time Offset (min)	Area (counts)	Sep. Code	Width 1/2 (sec)	Status Codes
1		0.4305	1.809	0.000	966	BB	1.7	
2	MITC	97.2144	2.474	0.014	218152	BB	2.3	
3		2.3552	2.732	0.000	5285	TS	0.0	
Totals:			100.0001	0.014	224403			

Total Unidentified Counts : 6251 counts